warwick.ac.uk/lib-publications

EXCHANGE RATE STABILITY IN THE NINETEEN-THIRTIES

BRITAIN, NORTH AMERICA AND THE GOLD BLOC

John Redmond, MSc. Econ. (Wales)

Submitted for the Degree of Ph.D.
at the University of Warwick.

July, 1982,
Department of Economics,
University of Warwick.

CONTENTS

TABLES AND DIAGRAMS

ABBREVIATIONS

COL	Cost of Living (indices)
CPI	Consumer Price Index
CORC	Cochrane-Orcutt (Estimation Technique)
EEA	Exchange Equalisation Account
EER	Effective Exchange Rate
ID	(Official) Intervention Dummy
MERM	Multilateral Exchange Rate Model
OLSQ	Ordinary Least Squares
PPP	Purchasing Power Parity
SV	Speculative Variable
ROW	Rest of the World
WG	Wage (indices)
WP	Wholesale Prices
WPI	Wholesale Price Index
WW1	World War I

DECLARATION

The material contained in Chapters 9 and 10 has been used in the following:

(1) An Effective Exchange Rate for the Pound in the 1930's (Warwick Economic Research Papers, No. 123, Department of Economics, University of Warwick, November, 1977).

(2) An Indicator of the Effective Exchange Rate of the Pound in the Nineteen-Thirties (Economic History Review, February, 1980).

(3) More Effective Exchange Rates in the Nineteen-Thirties: North America and the Gold Bloc (University of Birmingham Discussion Paper, Series D, No. 8, Faculty of Commerce and Social Science, July, 1981).

SUMMARY

The starting point of the thesis is the contention of Nurkse (1944) that exchange rates in the 1930's were unstable and subject to destabilising speculation. This view has been widely accepted and the few studies that have examined the issue since tend to be obscure and limited in scope. The principal objective of the present study is to provide a thorough (mainly econometric) test of the counter-hypothesis that exchange rates were, in fact, determined by "economic fundamentals" (particularly relative prices, incomes and interest rate differentials) in this period. Consequently, a model of exchange rate determination is developed and applied to the currencies of Britain, America, Canada, France, Belgium, Holland and Switzerland, both bilaterally and multilaterally.

The calculation of multilateral (or effective) exchange rates for the 1930's was considered a useful exercise in itself since they did not appear to be available. It seemed, therefore, desirable to digress and examine the methodology of their construction and to consider some general implications of referring to multilateral (instead of bilateral) exchange rates in the 1930's, before using them to test the central hypothesis multilaterally.

The main conclusion of the thesis is that, to a large extent, exchange rates were indeed determined by "economic fundamentals" and were not distorted by persistent destabilising speculation (the Nurkse view), although the latter was important occasionally. The evidence was stronger for bilateral than multilateral rates; however, this probably reflects the limited nature of the tests involving the latter. Finally, where there was sufficient information for an adequate test, official intervention was also found to be important and, more generally, it was argued that any instability was probably due more to government intervention than to destabilising speculation.

SECTION I: INTRODUCTION

CHAPTER 1

INTRODUCTION

(I)

The collapse of the Bretton Woods system and the consequent
widespread adoption of floating exchange rates in the 1970's has
created a revival of interest in earlier periods during which exchange
rates were not fixed. Of particular interest in this context is the
1930's; not only is this the most recent historical episode of general-
ised floating but it has been put forward as a classic example of all
the dangers inherent in floating exchange rates[1] and this inter-
pretation played an important role in the debate over international
monetary arrangements to be established after the second world war,
which ultimately produced the Bretton Woods adjustable peg system.
It is therefore somewhat surprising that no systematic, quantitative
study of the fluctuations of the major currencies in this period exists,
although studies of individual exchange rates are now beginning to
emerge. [2]

The condemnation of floating exchange rates which contributed
most to the accepted wisdom that has prevailed throughout much of the
post-World War II period originated in the work of Nurkse (1944) and
this is the starting point of the present study. Basing his conclusions
on little more than casual empiricism Nurkse gave three reasons why
floating rates were to be avoided:

> "In the first place, they create an element of risk which
> tends to discourage international trade.....Secondly, as a
> means of adjusting the balance of payments, exchange fluc-
> tuations involve constant shifts of labour and other resources
> between production for the home market and production for export.

Such shifts may be costly and disturbing; they tend to
create frictional unemployment, and are obviously wasteful
if the exchange-market conditions that call for them are
temporary......Thirdly.../any/...considerable or continuous
movement of the exchange rate is liable to generate antici-
pations of a further movement in the same direction, thus
giving rise to speculative capital transfers of a dis-
equilibriating kind...." (3)

Particular stress is placed on the third argument which is reiterated

at various stages in Nurkse's study, most explicitly:

"If currencies are left free to fluctuate, 'speculation'...
...is likely to play havoc with exchange rates...."(4)

In support of this contention Nurkse draws on the experience

of floating in the inter-war period. However, it is very noticeable

that his most convincing examples of destabilising speculation relate

largely to the 1920's - particularly the French franc in 1922-26 - and

that his examples for the 1930's are very limited (confined to one page)

and are rather questionable. In fact they are really assertions rather

than evidence. He simply states that:

"After the breakdown of exchange stability in the 'thirties,
whenever exchanges were left to their own fate, such
/disequilibriating capital/ movements....played an important
part..." (5)

and gives three examples:

"...the American dollar in 1933, the French franc at certain
times during 1937 and the pound sterling in the first few
months after September 1931". (6)

Whether these examples can justifiably be used to provide evidence

of destabilising speculation under floating exchange rates is debatable.

In all three cases the currencies concerned had just left the gold

standard, and it is not unreasonable to argue, that such instability

of exchange rates as did occur, can more correctly be attributed to the

misguided attempts to fix the exchange rate in the immediately
preceding period and are therefore more properly interpreted as
examples of the disadvantages of fixed exchange rates. Nurkse's
view, that the presence of destabilising speculation in the 1930's
illustrates a major drawback of floating exchange rates, would thus
appear to rest on rather flimsy evidence and would seem to be more
an assertion than an empirically supported conclusion.

This point has been taken up by Aliber (1976) who argues that
during times of (price) instability, such as the 1930's, fixed exchange
rates cannot function. Consequently, instability in the 1930's pre-
cluded the use of fixed exchange rates and made floating inevitable.[7]
The implicit conclusion of Nurkse - that fixed rates would have worked
better - is therefore incorrect and the 1930's cannot be held up as an
example of a period in which this is true (although this point of view
does not exactly conflict with Nurkse's argument about destabilising
speculation but rather modifies it to state that floating exchange rates
were made more unstable than they could have been by such speculation).

The present study attempts to take the argument one step further
by examining the hypothesis that not only does the experience of the
1930's provide little support for fixed exchange rates (Aliber's point)
but it does not even provide particularly good evidence that floating
rates tend to be unstable. This hypothesis is to be tested by specifying
a model of exchange rate determination which contains two sets of variables:
"economic fundamentals" (such as relative prices), which might plausibly
be expected to cause exchange rates to change; however, such changes do
not imply disequilibria but simply movements from old to new equilibria;
and "non-economic" or perhaps better, "speculative" variables which
seek to allow for destabilising speculation of the Nurkse variety. To

the extent that the former group of variables are significant and
the latter are not, then this provides support for the hypothesis
that exchange rates were not subject to violent fluctuations caused
by destabilising speculation in the 1930's but such changes that did
occur were simply movements to new equilibria (justified by changes
in the "fundamental" economic variables which determined exchange
rates).

(II)

At this stage something needs to be said about exactly what is
meant by exchange rate "equilibrium" and the associated concept of
exchange rate "stability". In common with many others, Nurkse often
seems to implicitly define stability as "lack of movement"; indeed, he
addresses himself to "the question of fluctuating versus stable exchanges".[8]
However, whether stability and lack of variation amount to the same
thing is debatable. The dilemma is succinctly summed up by Viner:

> "...one economist's 'stability' may be another one's
> 'rigidity' and....one economist's 'instability' may be
> another one's 'flexibility'...." [9]

In fact a floating exchange rate which changes gradually according to
the underlying trend may be construed as more "stable" than a fixed
rate with periodic, discontinuous (and comparatively large) changes
to new fixed levels.

This is because an exchange rate can only really be stable if it
clears the market and equates supply and demand for foreign currency
because only then will there be no pressure on the exchange rate to

change; the exchange rate that does this is the equilibrium rate and, in fact, any attempt to peg the rate (excepting a fortuitous accident) must lead to disequilibrium. Indeed this is the explicit (as opposed to the seemingly implicit) definition adopted by Nurkse:

> "...the equilibrium rate of exchange...is the rate which, over a certain period, maintains the balance of payments in equilibrium without any net change in the international currency reserve". (10)

This is also the position adopted here. Such a definition would make the exchange rate a function of the variables that influence demand and supply for foreign currency and insofar as these variables change then the equilibrium exchange rate must change also. These variables are the "economic fundamentals" referred to earlier and are specified in detail in chapter four. Consequently, the equilibrium exchange rate is seen as constantly changing as these "economic fundamentals" change and, to the extent that exchange rates were determined by these variables in the 1930's (which is the hypothesis tested in the present study), then exchange rates were "stable". The concept of exchange rate equilibrium receives further attention in the next chapter.

However, even if Friedman's dictum - that "stability is not rigidity"[11] - were accepted, there would still be some (presumably including Nurkse) who would argue that floating exchange rates still change more than they ought to (for example, in the 1930's) and are consequently "unstable" (by whatever definition) because of destabilising speculation. The present study also addresses itself to this question. A theoretical debate has raged over this matter for some years beginning with Friedman's well-known contention that speculation can only be de-stabilising if speculators, on the average, lost money.[12] The sub-sequent contributions mainly consisted of attempts to devise examples

in which speculation could be both destabilising and profitable[13] and the debate was summarized by Sohmen (1969) who concluded that destabilising speculation was unlikely to be profitable.[14] However, the lack of convincing theoretical examples of destabilising and profitable speculation is not in itself conclusive and, perhaps Baumol's position is the most reasonable:

> "I believe...that the effects of profitable speculation on stability is in part an empirical question and that attempts to settle it by a priori arguments must somewhere resort to fallacy". (15)

This is very much the view adopted here and attempts to explicitly model destabilising (or otherwise) speculation are discussed in chapter four.

Moreover, this position is reinforced by recognition of an important implicit assumption underlying the above debate (including Friedman's initial contribution) which is that speculators, or at least the majority of them, are successful in that they make a profit. However, it may well be that speculators sometimes make mistakes, and whilst this cannot go on indefinitely (unless there is a continuous supply of new, inept speculators), it may still go on long enough to exert a destabilising influence on exchange rates; this is especially true in periods of uncertainty, during which speculators may be as uncertain as everyone else. Indeed Sohmen uses this explanation as a justification of the interpretation of the 1930's as a period of destabilising speculation:

> "It should not be too surprising that speculators' anticipations should often have turned out to be incorrect under the chaotic conditions of the depression years when even policymakers frequently had no idea what to do next". (16)

The empirical tests to be undertaken in the present study should shed some light on this contention.

(III)

The main objective of the thesis is therefore, having defined stability, to test the hypothesis that exchange rates were stable in the 1930's whilst, at the same time, testing for the presence of destabilising speculation (in an explicit rather than implicit way). Since stability has been defined in terms of dependency of the exchange rate on "economic fundamentals", an attempt is made to identify the latter and develop a simple model of exchange rate determination. What eventually emerges is basically an extended purchasing power parity hypothesis. An additional point of interest relates to the fact that the 1930's saw the establishment of exchange intervention funds to "manage" exchange rates, first of all in Britain, but later in many other countries; since it is obviously necessary to include official intervention in the model, then an examination of this development is a lesser objective of the study.

The rest of this section is devoted to two surveys, the first of which (Ch. 2) examines various theories of exchange rate determination, concentrating on the purchasing power parity hypothesis, whilst the second (Ch. 3) looks at the relevant empirical evidence; this involves examining comparable studies - that is, those which use similar methodology - and also some rather dissimilar approaches, giving particular attention to those relating to earlier periods of floating (notably the inter-war period and the Canadian float in the 1950's). On the

basis of these surveys, a model of exchange rate determination
is developed in chapter four, the opening chapter in Section II,
which concentrates on bi-lateral exchange rates. The model is then
tested for a variety of bi-lateral rates involving the three major
world currencies at that time - the pound, dollar and (French) franc -
and four "minor" currencies - those of Canada, Belgium, Switzerland
and Holland and some preliminary conclusions are drawn (Chs. 5-8).

Section III approaches exchange rate stability in the 1930's
from a hitherto unexplored angle by applying the concept of multi-
lateral or effective exchange rates (developed in the 1970's). This
involves examining the methodology of effective rates (Ch. 9); effective
rates are then calculated for the seven currencies included in the
study and some general observations are made about their behaviour
compared to the more conventional bi-lateral rates (Ch. 10); finally,
a crude test of purchasing power parity is then carried out which
requires the calculation of comparable multilateral prices indices
(Ch. 11). Section IV draws together the two main threads of the
thesis and attempts to come to some conclusions about the stability
of both bi-lateral and multilateral exchange rates in the 1930's.
Some tentative conclusions are also suggested relating to official
intervention in the 1930's, the "pure" purchasing power parity
hypothesis and the role of speculative influences on exchange rates
(and consequent destabilising speculation) in this period.

NOTES TO CHAPTER 1

1. The standard (and one of the earliest) references which made this assertion is Nurkse (1944), which is discussed in detail below.

2. See Hudgins (1973), Ozmun (1976) and Ridpath (1975). This deficiency of empirical studies is in sharp contrast to the early 1920's which seem to have attracted much more attention. See, for example Aliber (1962), Frenkel (1980a), Grissa (1967), Hodgson (1971) (1972), Hodgson and Phelps (1975), Stolper (1948), Thomas (1973a) (1973b), and Tsiang (1959).

3. Nurkse (1944), p. 210.

4. Ibid, p. 138.

5. Ibid, p. 118.

6. Ibid.

7. Aliber (1976), p. 311.

8. Nurkse (1944), p. 210.

9. J. Viner, "Some International Aspects of Economic Stabilisation" in L.D. White ed., "The State of the Social Sciences" (1956) p. 283.

10. Nurkse (1944), p. 124.

11. Friedman and Roosa (1967), p. 77.

12. Friedman (1953), p. 175.

13. See Baumol (1957) (1959), Kemp (1963), Stein (1971), Telser (1959) and Williamson (1972).

14. Sohmen (1969), pp. 59-74.

15. Baumol (1959), p. 302.

16. Sohmen (1969), p. 71.

CHAPTER 2

THE PURCHASING POWER PARITY HYPOTHESIS AND

OTHER THEORIES OF EXCHANGE RATE DETERMINATION

The purchasing power parity (PPP) hypothesis represents one of the oldest theories of exchange rate determination; its development, at least in modern times is normally attributed to Cassel (1918, 1922). The model developed and tested in the present study is very much in the spirit of this hypothesis (if it does not quite follow the letter) and, as already indicated, it can (in many ways) be considered as an extended version of the PPP hypothesis. This choice of the PPP hypothesis as the starting point would seem to be justified on the grounds that few theorists (of whatever persuasion) would completely discount the potential role of   relative prices. It is probably quite true that "under the skin of any international economist lies a deep-seated belief in some variant of the PPP theory of the exchange rate".[1] Nevertheless some attention must be paid to the development of new theories of exchange rate determination as well as the readoption of old ones that has accompanied the revival of interest in the subject associated with the recent widespread adoption of floating exchange rates.

As a consequence of this, it soon becomes very clear that an eclectic approach to exchange rate determination is likely to be most productive and so an attempt is made below to incorporate elements of newer (and older) theories into the model to be tested here. Therefore, a brief survey of the theory of PPP is followed by a survey of alternative approaches, highlighting those aspects that might usefully be

added to extend the PPP hypothesis. The problems relating to testing PPP are then discussed in detail on the grounds that, just as a simple PPP test would have to deal with these problems, so will an extended version.

It should be pointed out that the objectives of much of the more recent work and those of the present study are rather different. The former are usually concerned with either predicting the future course of exchange rates or explaining recent exchange rate movements which have, to some extent, been rather more erratic than might have been expected in the light of the debate over fixed and floating exchange rates in the 1950's and 1960's. In connection with this second aim it should be remembered that the 1970's environment is somewhat different to that of the 1930's. The degree of complexity of the international financial and commodity markets has much increased and various elements - the eurocurrency market being one of the most striking examples - simply did not exist in the 1930's. Nor were there so many important agents operating in the 1930's - clearly there was no OPEC and the role of Japan (and the yen) was minimal.

A similar comparison has been made by Frenkel (1980b) who compares the 1970's to the 1920's and much of what he says is equally applicable to a comparison between the 1970's and 1930's. In particular, he highlights a number of important developments in the post-World War 2 period: the greater integration of world capital markets, the greater role of "real" shocks and their effects on expectations, changes in tariffs and non-tariff barriers to trade, the development of exchange rate management and, of course the creation of the International Monetary Fund. These differences may justify a simpler approach for the 1930's. Furthermore, returning to the objective of the present study, this too

is rather simpler and in its starkest terms mainly relates to an examination and test of the hypothesis that movements in exchange rates were determined rather more by changes in "fundamental economic variables" (and therefore did not represent disequilibrium but movements from old equilibria to new ones) than is commonly supposed.

(I)

The theory of PPP has a long and distinguished history dating at least as far back as Ricardo and Wheatley.[2] Interest in more modern times has been generated largely by the work of Cassel (1918, 1922)[3] in the inter-war period, who produced a more systematic version of the theory and introduced some numerical content, and its more recent exponents have included Yeager (1958, 1976) and Thygesen (1978). Nor has the theory been short of critics both in the times of Cassel[4] and in more recent years.[5] In fact the debate over the validity of the PPP has been one of the most long-standing controversies in economics. The fact that there are a variety of different versions of the theory (and various extended versions like that developed here) has fuelled the controversy and led to some confusion over what exactly a particular author is rejecting or accepting. Moreover, there are those who would agree that prices and exchange rates move together over time but who, instead of accepting the PPP interpretation - that changes in prices lead to changes in exchange rates - would either argue in favour of what might be called "reverse causality" (exchange rate changes lead to price changes)[6] or simply that prices and exchange rates are both endogenous and are affected in the same way by a variety of (exogenous) other variables.[7]

The basic premise of the PPP hypothesis is perhaps best stated
by Cassel himself:

> "....the rate of exchange between two countries is primarily
> determined by the quotient between the internal purchasing
> power against goods of the money of each country...At every
> moment the real parity between two countries is represented
> by this quotient...I propose to call this parity the "purchasing
> power parity".. " (8)

This is the theory at its simplest and some elaboration is required:

> "The propositions of PPP theory are (1) that the short run
> equilibrium exchange rate is a function of the long run
> exchange rate in the sense that the former variable tends
> to approach the latter and (2) that the PPP is either the
> long-run equilibrium exchange rate or the principal determin-
> ant of it". (9)

Thus, exchange rates (both long and short run) are conceived as being
ultimately determined by relative prices in some sense.

There are essentially two versions of PPP - or perhaps better
"two approaches to implementing its exchange rate-calculation aspect".[10]
The "absolute" version (equation 1.1) suggests that the PPP between
two countries is simply the ratio of their price levels at any given
time, with the price level measured as an index with the same basket
of goods and services (and consequently the same weights) for each
country. The "relative" (or "comparative") version (equation 1.2)
asserts that the current PPP can be calculated by comparing current
price levels with those prevailing in some base period when the exchange
rate was at an equilibrium level: this involves simply multiplying the
base period exchange rate by the ratio of the two countries' price
indices which obviously have to have the same base year as the exchange
rate, and their method of construction should not have changed, but
they do not have to have the same weights. Thus :

$$PPP(Ab.)_t = P_t^A / P_t^B \qquad\qquad (1.1)$$

$$PPP(Rel.)_t = (P_t^A / P_t^B) \cdot R_o \qquad\qquad (1.2)$$

where $PPP(Ab.)_t$ = absolute PPP in period t (in units of A currency per B currency).

$PPP(Rel.)_t$ = relative PPP in period t (in units of A currency per B currency)

R_o = actual base period of exchange rate (A currency per B currency)

$P_t^{A(B)}$ = an index of country A's (B's) prices in period t

In principle, there is no strong case for preferring the absolute to the relative version or vice-versa; the main difference occurs in practice where relative PPP has one big advantage, namely that direct comparison of purchasing powers requires the use of the same index in both countries containing the same standard assortment of goods and services (which must be representative in both countries) with the same weights. Clearly the construction of such indices is quite a task in itself. Relative PPP, on the other hand, simply involves looking at the degree of change in the separate (and not necessarily similarly constructed) national price indices. This is not to say that the relative version of PPP is without problems - indeed, in side-stepping one problem it creates others such as the choice of base period and so on. However such problems are more easily overcome (or at least their effects minimized) and will be discussed in a later section. Moreover, the fact remains that relative PPP has been favoured em-pirically (and the present study is no exception) and therefore inso-far as we are talking about a particular version, it is relative PPP

that is implicitly being discussed. However, in actual fact, this
is not especially important since although some of the criticisms
to be discussed can be more forcefully applied to one or other of
the versions, in general, any argument which undermines use of
absolute price levels as the major determinant of exchange rates
will also undermine the use of changes in absolute price levels (that is
relative PPP).

The main mechanism by which changes in relative prices are
transmitted to exchange rates is commodity arbitrage. This is des-
cribed by Yeager:

> "Suppose....that prevailing exchange rates unmistakably
> undervalue the British pound in relation to the purchasing
> powers of the pound and of foreign currencies. Foreigners –
> say Americans – will offer dollars for pounds to buy British
> goods at bargain prices. Britons will offer relatively few
> pounds for dollars to buy American goods at their apparently
> high prices. Unmatched attempts to sell dollars and buy
> pounds will bid the exchange rate toward the equilibrium
> level. The converse analysis applied if the pound is over-
> valued." (11)

The fact that this arbitrage is not instantaneous due to various
lags and market imperfections is why PPP tends to be a longer run
phenomenon although expectations and consequent stabilising speculation
may help push rates towards their PPP level even in the short run.

This is what might be called the "naive" PPP theory. There is
nothing logically wrong with it although acceptance of it rather depends
on whether or not the existence of long run commodity arbitrage is also
accepted. There is conflicting evidence on this: convincing evidence
that this "law of one price" does not hold is provided by Kravis and
Lipsey (1978) for a variety of countries and by Richardson (1978) in
the Canada-U.S. case; on the other hand, a critical review of such

studies and some conflicting evidence is provided by Genberg (1978)
thereby suggesting that commodity arbitrage may be effective after
all. Moreover, there is an inherent logic in Yeager's argument that
commodity arbitrage must begin to work within certain limits: to
show this he uses Heckscher's concept of "commodity points" which
are similar to gold points under the gold standard (although they
may be wider):

> "Just as gold-standard exchanges fluctuate within the gold
> points, so paper exchanges fluctuate within 'commodity points'.
> Just as the spread of upper and lower gold points from mint
> par depends on the costs of shipping gold, so the spread of
> upper and lower commodity points from 'price parity' (as
> Heckscher called it) depends on the costs of and other
> obstacles to shipping commodities". (12)

Now, whilst the work of Kravis and Lipsey (1978) and the other
critics may be interpreted to suggest that the "other obstacles" are
quite substantial so that these so-called commodity points are quite
wide, they must surely exist and so PPP will hold, albeit within
fairly wide limits, and this is really all that the naive version of
PPP is suggesting. Moreover many economists, in criticising "naive"
PPP, have really been attacking what Holmes (1967) has called the
"dogma" of PPP - that the relative prices-exchange rate relationship
is a rigid and exact one. This is really an exercise in setting up
a straw man. Cassel's theory was certainly not the "dogma" nor even
the "naive" version; even he realised the "naive" version was naive,
and consequently allowed for a variety of other factors which could
distort exchange rates so that they did not approach their PPP levels
even in the long run. (13)

The first of these and, in the context of the 1930's, perhaps
an important one were tariffs, quotas and other trade restrictions

about which Cassel is quite explicit:

> "...⟨Although⟩...restriction of trade will not cause the
> rate of exchange to move from this purchasing power parity
> as long as they strike the trade in both directions equally....
> if the trade between the two countries is hampered more severely
> in one direction than in the other the rate of exchange will
> deviate from its purchasing power parity". (14)

Furthermore Cassel recognised that not all trade restrictions were

artificial:

> "The restrictions of which we have to take account in this
> connection may be of various kinds...⟨They⟩...may...take
> the form of artificial hindrances or natural difficulties
> hampering transport for the country A to the country B
> more seriously than the transport in the opposite direction.
> The result will be some undervaluation of the money of A in
> that of B". (15)

These two factors - artificial trade restrictions and transport costs -

could cause an exchange rate to deviate from its PPP even in the long

run if they were a permanent feature of trade between two countries.

There are also a number of other factors which can create

short run deviations from PPP, most of which were recognised by

Cassel, although his contention that their effect is a short run one

has been criticised.(16) Two of these factors relate to people's

views about the further course of exchange rates and presumably, if

such views were correct, would tend to push exchange rates towards

their long run PPP whilst creating a divergence from short run PPP.

The first of these concerns inflationary expectations:

> "A depreciation of a currency is often merely an expression
> for discounting an expected fall in the currency's internal
> purchasing power. The world sees that the process of
> inflation is continually going on.....The international
> valuation of the currency will, then, generally show a
> tendency to anticipate events....." (17)

The second, closely linked, is speculation:

> "The value of a currency may also be depressed below the
> purchasing power parity by speculations in exchange". (18)

Although potentially stabilising, inflationary expectations and,

especially, speculation can lead to large deviations from PPP if

they get out of hand and Cassel believes that this indeed did happen

in the case of the German mark in the early 1920's.[19]

Officer (1976a) also lists three other factors which Cassel

recognised as potential causes of short run deviations from PPP.

One of these was long term capital movements:

> "The third group /of factors creating divergence from PPP/
> contains those disturbances that may be caused by inter-
> national movements of capital. When..../various conditions
> are fulfilled/....and when no capital movements in either
> direction take place, the rate of exchange must stand at the
> equilibrium level represented by the Purchasing Power Parity
> and cannot show more than small and quite temporary deviations
> from this level". (20)

> "A closer study of the dollar in pounds sterling during the
> period 1919-24 shows that the origin of the deviations of
> the actual rates of exchange from the purchasing power
> parity is to be found essentially in international movements
> of capital". (21)

Thus Cassel explicitly recognised that a long term capital outflow

could depress a country's currency below its PPP level and a capital

inflow push it above its PPP level.

Cassel also recognised that government intervention could cause

a divergence from PPP although he did not construe the intervention

as a means of deliberately influencing the course of the exchange rate

but rather as a means of obtaining foreign exchange:

"By far the most important of the depreciating factors
now under discussion, however, is the practice of selling
at any price a country's exchange in other countries in
order to procure funds in their money.....The case of
Germany offers the best means of studying the whole
problem.....When the central Government.../was/....in
dire need of foreign means of payment, and it did not
seem possible to procure it in any other way, the country
was beguilded into thus getting money on its currency". (22)

A final factor creating a divergence from PPP listed by Officer (1976a)

concerns real changes in the economy (from the base period) as in-

dicated by changes in relative prices within a country leading to a

divergence between the exchange rate and relative PPP as measured by

a general price index. In particular Cassel seemed to be concerned

about changes in the relative prices of traded and non-traded goods.[23]

His answer to the problem (in the context of equilibrium exchange rates

for the post-World War 1 period) appeared to be either a hope that

these real changes would reverse themselves and trade would return

to its pre-World War 1 pattern or, failing this, a continuous study

of these real changes and then allowance for them (assuming they could

be adequately explained by known factors).

Thus there are a number of factors which can cause deviations

from PPP (especially in the short run). The first two of those dis-

cussed above - trade restrictions and transport costs - can be ignored

in principle, as far as relative PPP calculations are concerned, if they

remain at the same level in both the current period and the base period.

Unfortunately, in practice, whilst this may be true for the latter in

the 1930's, it is certainly not true of the former and more will be

said about trade restrictions in Chapter four below. The opposite

is true of real changes in the economy of the type discussed above

and international capital movements which, though valid in principle,

can probably be largely dismissed in practice for the 1930's: the

timespan between the base period and the period for which the
model is being tested is possibly sufficiently small to make signif-
icant real changes unlikely whilst international long term capital
movements were muted because of increased uncertainty due to political
tension in Europe, war in the Far East and the increase in defaulting
on foreign bonds which occured in the 1930's and, in any case, the
growth of exchange controls made the transfer of both capital and
interest payments very difficult in some parts of the world.

Three other factors have been mentioned. The first of these,
inflationary expectations, would act to push the short run exchange
rate towards its long run PPP equilibrium and would tend to suggest
a central role for current prices in the determination of short run
exchange rates; the role of inflationary expectations is hence not
only accepted but plays an important part in the model tested here.
Similarly, the roles of government intervention and (private) specu-
lation in causing the exchange rate to deviate from its PPP path are
recognised as being potentially very important and are explicitly
incorporated into the model developed in Chapter four. As far as
the PPP hypothesis is concerned, this addition of variables raises
the question of when the theory of PPP ceases to be and transforms
itself into something else. Some theories start from the opposite
extreme and do not include or emphasise prices in particular and then
work back towards the PPP hypothesis. It is to these alternative
approaches   which we now turn.

(II)

There are many non-price factors which influence exchange rates,

some of which are by no means rational - for (an extreme) example,
the role of the Invergordon "mutiny" in Britain's leaving the gold
standard in 1931 - and it is quite clear that at certain times the
course of a particular exchange rate has been largely determined by
such factors in the short run. A good historical example of this is
provided by the French franc in the 1924-26 period[24] and at the
present time the fact that eight European currencies are committed
to remaining within the European Monetary System must have some
independent influence on their exchange rates. A whole list of non-
price variables that may cause deviations from PPP has already been
presented in the previous section and this was not exhaustive. The
objective here is to re-examine some of these variables and to briefly
consider any further potential non-price, influences along with any
cohesive alternative (to PPP) theories of exchange rate determination.

An examination of such non-price influences is provided by
Schadler (1977) who posed the question as to why exchange rates had
been so erratic in the first four years following the widespread
adoption of floating exchange rates in the 1970's. Four possible
(and not mutually exclusive) explanations for this were suggested:
destabilising speculation, different speeds of adjustment (suggested
by the asset market approach to exchange rate determination), uncer-
tainty and risk, and government intervention. The first of these
(speculation) plays an important role in the model developed here:
stabilising speculation would push the exchange rate towards its
long run PPP level and consequently its existence would support the
use of only a short lag on prices (or, put another way, a role for
current or very recent price levels in determining the current exchange
rate) whilst destabilising speculation is explicitly incorporated in

the form of dummy variables. The role of government intervention
will also be modelled and indeed testing for its significance is an
important subsidiary issue.

Uncertainty and risk (caused by instability of the world
economy in general) may influence exchange rates through two potential
avenues: "via the variability of fundamental determinants of the
exchange rate.../and/...also via the uncertainty about exchange rate
expectations that such variability generates".[25] Clearly funda-
mental variables are directly included here and the second avenue -
changes in exchange rate expectations - will, to a large extent, be
picked up by the dummy variables to be included (discussed in later
chapters). Schadler's final possible explanation relates to the asset
market approach which will be discussed shortly. The study by Schadler
(1977) typifies much recent work which approaches movements of exchange
rates in terms of trying to explain "overshooting" - that is deviations
from some equilibrium exchange rate path which is often, implicitly
or explicitly, derived from PPP.

Two popular, though incomplete, approaches to the short run
behaviour of exchange rates are the interest rate parity theory (or
forward exchange theory) and what might be termed the "speculative
run view". The latter is based on "the view that exchange rates move
in speculative runs, perhaps touched off by a change in (or a revision
of expectations about) fundamental economic conditions, but thereafter
reflecting a self-sustaining speculative mentality".[26] In a sense,
this is merely an updated version of destabilising speculation and its
validity has been questioned;[27] nevertheless, it does stress the
role of expectations in exchange rate determination, particularly in
the 1970's, and, to that extent, is very much in tune with the asset

market approach (discussed below).[28]

The interest rate parity theorum has some historical pedigree, dating back to the period in which Cassel was developing the PPP hypothesis;[29] it suggests that the spot exchange rate is "explained" by the forward exchange rate and interest rates. In principle, since it is basically a pure arbitrage condition, interest rate parity should hold at all times but empirical evidence has indicated the existence of deviations in practice. However, a number of explanations have been put forward,[30] most plausibly the effect of transaction costs and the fact that different securities in different countries (and hence the rates of interest) are not comparable because they are associated with different degrees of risk; the possibility of exchange controls has been suggested in the latter context.[31]

This would seem a particularly relevant consideration in the 1930's - for example, it was widely expected that extensive exchange controls would be adopted in France after the election of a Socialist government in 1936 - and, consequently, would indicate that the interest rate parity theorum is an inappropriate framework in which to examine exchange rate determination in the 1930's. Furthermore, its validity as a general theory of exchange rate determination has been questioned on the grounds that all three variables involved are really endogenous and, in fact, spot exchange rates are actually determined by a set of exogenous variables which also determine forward exchange rates and interest rates.[32]

Another, potentially more complete approach to exchange rate determination is the traditional balance of payments view which suggests

that exchange rates vary so as to ensure equilibrium in the currency
market. While most economists would accept that this is generally
true, it would not be widely supported as a useful approach in its
naive sense, in which it implies that exchange rates depend on the
current (or trade) account position. Even though some relationship
between the exchange rate and the current balance no doubt exists,
the capital account cannot be so blatantly neglected. This view of
exchange rate determination is behind the underlying payments dis-
equilibria approach to calculating the equilibrium exchange rate
which it defines as that which is compatible with "a desirable and
sustainable balance-of-payments position".[33] This is more sophisticated,
in that, for calculating the gap between the future equilibrium balance
of payments position and exchange rate and the actual, it advocates
a complete world trade model to project their future paths; consequently
it seeks to correlate the exchange rate not simply with the current
account but with the variables that determine the current account.
The balance of payments approach is intuitively very appealing and
while the model to be presented here has been referred to as an ex-
tended PPP hypothesis it is sufficiently eclectic to be approached by
this alternative route; indeed it can be presented in such a way as
to appear to use the balance of payments view as its starting point
with the PPP hypothesis incorporated within this.

The final (and most important) alternative approach to exchange
rate determination to be considered, is the asset demand or asset
market theory. Facilitated by developments in the analysis of port-
folio balance,[34] this approach emerged as a result of the Canadian
experience of floating exchange rates in the 1950's when it became
clear that prices were not the major determinant of exchange rates in

that particular case:

> "The Cassellian view of the primacy of price changes rests
> on the assumption that demands for currencies are largely
> derived from current trade, and that holdings of foreign
> financial assets are motivated mainly by the purchasing
> power they yield over goods produced in the foreign country.
> In the Canadian balance of payments, however, capital trans-
> actions - especially with the United States - dominate and these
> financial and direct investment flows are transparently sens-
> itive to changes in profit opportunities arising out of
> international differences in interest rates and trends in
> unit costs". (35)

More explicitly:

> "The asset-market theory.....focusses on the equilibrating
> role of the exchange rate in balancing the foreign demand
> for domestically issued financial assets and the domestic
> demand for foreign financial assets.....the relative demands
> for domestic and foreign assets by private market participants
> depend on the expected relative yield on these assets. The
> expected relative yield in turn depends on the interest rate
> differential.....and on the expected change in the value of
> the spot rate...." (36)

There are two important differences between the asset market
approach and a more traditional (relative price-based) view of
exchange rate determination: firstly, the former sets exchange rate
determination in the markets for stocks of assets, whilst the latter
assumes that exchange rates are determined in the market for flows of
funds (to buy goods and services); and secondly, the asset approach
views exchange rates as the price of national monies and exchange
rates as being determined by stock adjustments of people's holdings
of different monies, whilst the traditional theory considers the
exchange rate as the price of national output and consequently it is
the relative prices of goods and services which determine the exchange
rate. Despite these differences, however, it may well be correct to
assert that the two theories are "tailored to different and extreme
market conditions": (37) the traditional theory is most suitable where

currencies are held mainly for transactionary motives such as those
of small open economies like Belgium and the Netherlands while an
asset theory clearly applies where currencies are held for purely
precautionary reasons which would seem to apply to many holders of
Swiss francs in recent times, for example. Of course, in many (if
not most) cases currencies will be held for both transactionary and
precautionary motives and so some synthesis is required.

In fact, proponents of the asset market approach generally
assume, for the sake of simplicity, that there is only one asset
(money) and refer to "the monetary view (or more generally an asset
view) of exchange rate determination".[38] The monetary approach
has been summarized as follows: "First....exchange rates are best
thought of as relative prices of different national monies....and
are determined primarily by the conditions for equilibrium between
the demands for the stocks of various national monies and the stocks
of these monies available to be held. Second....exchange rates are
strongly influenced by asset holders' expectations of the future
behaviour of asset prices".[39] Thus the monetary approach would
see the major determinants of exchange rates as national money supplies
and expectations about the future level of the exchange rate (which
are closely related to expectations about the future course of money
supplies); the importance of expectations, in particular, is very
strongly stressed by the "monetarists" and has been used to explain
the erratic movements of exchange rates in the 1970's. A role would
also be given in a monetary model to changes in real income.[40]

However, the monetary approach has been criticised for taking
too narrow a view of what constitutes "financial assets":

".....there is hardly any theoretical presumption that
shifts in the market for money are 'more important'
(for the exchange rate and/or the balance of payments)
than shifts in the markets for interest-bearing financial
assets. Empirical evidence in recent years suggests, in
fact, that portfolio shifts have often taken place
between earning assets.....rather than just money. Thus
there is hardly any reason to turn an 'asset theory' into
a 'monetary theory'...." (41)

An important implication of such criticism is that more general

asset market theories should be preferred which would indicate a

substantial role for interest rates. This criticism, combined with

the fact that the model developed here contains some variables in-

cluded in asset market models - real income, interest rates[42] and,

most important, speculative or expectations variables - perhaps

constitutes a good enough reason for not adopting an explicit monetary

approach in the present study.

In any case the monetary approach incorporates the PPP concept

in a number of ways. Most fundamentally, it actually accepts the

relationsip embodied in the PPP hypothesis, but interprets it as an

equilibrium relationship between two endogenous variables with no

causality implied; it is a "shortcut" with both variables principally

determined by variations in money supplies. Secondly, it should be

observed that acceptance of the primacy of the asset market theory

in the determination of exchange rates in the short run is not nec-

essarily incompatible with acceptance of PPP in the long run:

"As to the evolution of the exchange rate in the longer
run, however, the asset-market view is fully consistent
with the traditional view that it is essentially determined
by the purchasing power of the currency in the goods markets.
The long-run adjustment comes through arbitrage in the goods
markets and, as already noted, through the influence of long-
run expectations. Deviations of the exchange rate from its
PPP value will be self-correcting in the long run..." (43)

However, in the present study, it is the short run that is
important but even here, although "...explicit price effects....
are sometimes dispensed with altogether",[44] this is apparently
not true at other times since it is sometimes argued that "...one
aspect of the return to foreign currency holding is the purchasing
power it currently affords over goods produced in the issuing
country..."[45] which would seem to imply some role for relative
prices.

Furthermore, in the context of the model used here (developed
in chapter four), there is a direct point of contact with the monetary/
asset approach (and possibly the PPP hypothesis) in that expectations
are specifically included both here and in monetary models. This would
seem important:

> "The central insight obtained from this.../monetary/asset/...
> approach is the recognition that expectations concerning
> future exchange rates are among the prime determinants of
> current exchange rates". (46)

The relationship with PPP comes from recognising the fact that
expectations of exchange rate changes may be related to expectations
about future levels of inflation (although a "monetarist" would pre-
sumably deny this by arguing that, since money supplies determine prices,
it is expectations about future money supplies that determine exchange
rate expectations) and/or to a belief that PPP holds in the long run.
Moreover, a common proxy for the expected future exchange rate in
monetary models - the forward market premium/discount - is also tried
in the present study (in an adjusted form) for much the same purpose
(although ultimately dummy variables are preferred).

In a sense, all this leads back to the question of when exactly

the PPP hypothesis ceases to be and becomes something else. The
three major "complete" approaches to exchange rate determination
discussed above - the traditional balance of payments view, the PPP
hypothesis and the asset market approach - would appear to have some
similarities. All would seem to accept some relationship between
relative prices and exchange rates (although the monetary approach
would not see it as a causal one): the traditional view would stress
commodity arbitrage, a Casselian PPP hypothesis would accept this but
propose links between prices of traded and non-traded goods and hence
between exchange rates and all prices or else propose that shifts
in the relationship between prices of traded and non-traded goods
were temporary, and a monetary approach, whilst also accepting
commodity arbitrage, would view prices not as the price of output but
as the price of money.

The final equation estimated here could be seen as being based
on either of the first two models: a balance of payments view (which
is how it is presented in chapter four) in which determinants of
trade (and capital) flows determine a floating exchange rate or an
extended PPP hypothesis, beginning with simple PPP, and then adding
variables to take account of various other factors, both those
identified by Cassel and by others. An explicit monetary approach
will be rejected on the grounds that it is too narrow and also because
it is based on a monetarist view of the world which may not have been
valid in the 1930's,[47] whilst a more general asset market approach
is not pursued because a number of variables which would be included
in such a model are incorporated in the extended PPP/balance of pay-
ments framework developed here anyway (most importantly expectations).
Thus, in view of the central importance of the PPP hypothesis in this

study, the rest of the chapter reviews the problems associated
with it and suggests how they might be overcome.

(III)

The major theoretical objection to the PPP hypothesis is that
it may be subject to some kind of systematic bias. A potential
source of such bias arises from differences in countries' internal
price ratios, that is the ratio of the prices of traded goods to
those of non-traded goods.[48] Commodity arbitrage is based on
traded goods but PPP is calculated from a more general index which
includes non-traded goods. If internal price ratios differ between
countries then a PPP calculation (based on a general index) will make
the currency of a country with relatively lower priced non-traded
goods appear undervalued. An attempt to provide a rationale for
such differences was undertaken by Hagen[49] who argued that the
internal price ratio is a function of per capita income. This was
based on the observation that in low income countries cheap labour
is readily available whilst non-traded goods are labour intensive;
consequently, the lower per capita income, the lower the relative
price of non-traded goods and therefore the higher the internal price
ratio. Unfortunately, this plausible line of reasoning tends to break
down when it is recognised that exports of many low income countries
are, in fact, labour intensive - for example, textiles.[50]

However, even if Hagen's argument is not accepted a plausible
and widely accepted alternative rationale for differences in internal
price ratios has been provided by Balassa (1964) based on differences
in productivity within and between countries. The argument runs as

follows: productivity differences between countries tend to be
higher in the traded goods sector than in the non-traded goods
sector mainly because there is more scope amongst the type of commo-
dities that are traded - mainly manufacturing and agricultural goods -
for productivity increases than amongst non-traded goods which are
often labour-intensive services. Since wages are related to produc-
tivity then inter-country wage differentials in the traded goods
sector will reflect productivity differentials with wages correspond-
ingly high in high productivity countries.[51]

According to commodity arbitrage the exchange rate will equate
the prices of traded goods - the "law of one price" - but this does
not apply to non-traded goods. If inter-country productivity
differences between traded and non-traded goods were the same or,
failing this, if prices of non-traded goods mainly reflected product-
ivity differences alone this would not matter, but the former is not
the case and neither is the latter (for a number of reasons including
the use of some traded goods as inputs for non-traded goods, competitive
bidding for factors of production and, mainly, because of the tendency
for wages to be equalised within countries). Consequently the prices
of non-traded goods tend to be higher in high-productivity countries
and there is a systematic bias in internal price ratios and so a bias
in PPP:

> "The greater are productivity differentials in the production
> of traded goods between two countries, the larger will be
> differences in wages and in the prices of services and,
> correspondingly, the greater will be the gap between pur-
> chasing-power parity and the equilibrium exchange rate". [52]

If per capita income levels are taken as representative of productivity
levels which does not seem unreasonable since a country is likely to

have a higher per capita income precisely because of higher
productivity - then the bias can be expressed as follows: the
ratio of PPP to the exchange rate is an increasing function of
income levels. Balassa then went on to provide an empirical veri-
fication of his hypothesis.

Although Balassa's reasoning has become fairly widely accepted,
his results have been strongly criticised on both theoretical and
empirical grounds, principally by Officer (1974,1976a,1976b). The
first theoretical criticism relates to the implicit assumption, made
by Balassa, that the impact of a given increase in productivity on the
internal price ratio is the same for all countries.[53] Specifically,
Officer suggests that if this impact is inversely related to levels
of productivity amongst countries then converging internal price
levels and diverging productivity levels are quite compatible
(although no good reason why such an inverse relationship should
actually exist is given). A second, more convincing, theoretical
criticism relates to the fact that Balassa ignores quality differences
in consumer services amongst countries.[54]

Officer begins his empirical attack by arguing that tests of
the Balassa hypothesis have produced rather mixed results and an
examination of the evidence would seem to bear this out: Delahaut
and Kirschen[55] and Balassa, himself, in a later article (1973),
support his conclusion whilst Clague and Tanzi (1972) found the
Balassa hypothesis holds for OECD countries but not Latin American
countries, and Grunwald and Salazar-Carrillo[56] supported this latter
conclusion; whilst failure of the Balassa hypothesis to hold for
developing countries is not surprising, De Vries (1968) using a
sample of sixty-two countries (including both developed and developing),

found no support for the hypothesis either. In the light of this,
Officer (1974, 1976b) sets out to rigorously test the Balassa
hypothesis. He begins by criticising the methodology of earlier
studies (especially that of Balassa himself), in particular Balassa's
use of only one variable - GNP per capita - to proxy productivity
and also his use of the current exchange rate as an approximation for
the equilibrium (PPP) rate;[57] in addition, there are numerous other,
less important criticisms. Officer then tests the Balassa hypothesis
(including re-running Balassa's original tests) using his improved
methodology and finds no support for productivity bias in absolute
PPP and virtually none for bias in relative PPP.

In the present context, the presence of productivity bias (if
it does exist) would not seem likely to cause any problems conceptually
as a suitable variable to allow for it can easily be incorporated into
the eclectic approach adopted here. However, at the empirical level
there are problems in that even the simplest proxy for productivity,
and one much criticised by Officer, GNP per capita, is not available
for the period under examination. In fact, national income is included
(for other reasons) in the model and a proxy (based on employment data)
has had to be found. Consequently, whilst productivity bias is allowed
for in that a GNP proxy is one of the independent variables in the model
it must be accepted that it is a poor proxy for productivity and com-
pletely lacks sophistication in this context.

A completely different, but probably more fundamental theoretical
criticism of PPP (which cannot be sidestepped by simply adding another
variable) should also be discussed before moving on to examine the
practical problems of applying the hypothesis; this is, what might be
called, the "reverse-causation" argument which states that exchange

rates determine prices rather than the other way round. If this is true then as Yeager notes:

> "....the statistical evidence in apparent support of purchasing power parity loses force if exchange rates determine rather than reflect the price levels used in the calculations". (58)

In fact it is Yeager who provides the most extensive arguments in defence of prices to exchange rates causation. His major argument is very simple: if exchange rate changes lead to changes in the prices of some goods then unless domestic money supply changes, other prices must move in the opposite direction because in the absence of a permissive monetary policy (or short run changes in velocity) the overall price level cannot change. To support his argument Yeager invokes an adaptation of the quantity theory of money.[59]

In practice a permissive money supply is quite possible but then the fact that causation runs from exchange rates to prices is "due not to inexorable linkages but to policy".[60] Yeager then goes on to attack the general presumption that devaluation and depreciation must be inflationary: if devaluation (depreciation) simply replaces trade controls which forced the balance of payments into equilibrium (by artificially raising prices) then the net effect on the price level is not necessarily inflationary.[61] Some evidence to support reverse causation is provided by Frenkel (1978) who argues that, insofar as there is any causation between the two variables, it runs from exchange rates. However, closer examination of his choice of price indices throws some doubt on this conclusion since two out of the three - wholesale prices and material prices - are heavily biased towards traded goods and thus composed chiefly of prices governed by exchange rates with the prices which undergo compensatory opposite

changes tending to be left out.

In fact, the relationship between devaluation (or depreciation) and inflation has been widely discussed in another context, namely the debate over the relative merits of fixed and floating exchange rates. The assertion that floating exchange rates (or more correctly depreciating exchange rates) are inflationary has been expounded at great length by proponents of fixed exchange rate systems.[62] What is interesting, and perhaps very relevant with regard to the question as to whether prices determine exchange rates or vice versa, is the uni-directional nature of the argument. The logically converse argument, that just as depreciation causes prices to rise so appreciation causes prices to fall, whose acceptance is not critical for the fixed versus floating exchange rate debate, but is important as far as causation is concerned, attracts much less attention and support.[63]

Nevertheless, there seems little doubt that causation between prices and exchange rates runs both ways to some extent, but the question as to which dominates may have different answers at different times. Whilst in present day Britain, trade unions can be relied on to make sure that any depreciation of the pound does influence prices, it is far from clear that this was true in Britain, North America and the gold bloc in the 1930's; the sanctions of mass unemployment were probably much stronger then than they are now. Indeed there is some contemporary evidence which rejects the hypothesis that devaluation led to inflation.[64] In addition, to the extent that trade was subject to high levels of protection, the Yeager/Sohmen argument (discussed above) may come into play; certainly in one case (Belgium), the level of protection was reduced following devaluation in an attempt to discourage retaliation.[65] In the light of all this, the view

adopted in the present study, that causation ran from prices to exchange rates does not appear entirely unreasonable.

There is, however, a third view adopted by Frenkel (1978) (and already referred to in the discussion of the asset market approach) who argues that there is no causation between prices and exchange rates, but, instead, interprets PPP as an equilibrium relationship between two endogenous variables. Frenkel then goes on to provide a theoretical argument to explain his findings that exchange rates appear to determine prices rather than vice versa (criticised above) in terms of differential speeds of adjustment: adjustment is faster in asset markets than in commodity markets and consequently exchange rates are influenced more quickly than prices by the third factors which determine them both, and therefore causality appears to run from exchange rates to prices.

If this is accepted then "reverse causality" is no longer a problem since money (supply), not prices, is the truly exogenous variable and this can be introduced to replace prices as the major independent variable in the exchange rate equation. Even if this were theoretically acceptable, and much of the argument presented here suggests that it is not, there are technical problems in terms of finding appropriate data for the 1930's. Data on currency in circulation and, in some cases, demand deposits, are available (in the League of Nations Monthly Bulletin) but their reliability and completeness as a measure of the "money supply" is dubious for many countries and both Hudgins (1973) and Ozmun (1976) obtained poor results when they made use of this data. Moreover, given the central role in the present study of the PPP hypothesis (which has been acceptable in some form to many

economists, for reasons already indicated), to exclude relative prices as a dependent variable rather defeats the object; indeed it actually prejudges the issue in favour of PPP since a starting point of the models of Frenkel and others is that PPP holds as an equilibrium relationship between two endogenous variables.

Ultimately, of course, the question of price-exchange rate causality may well be an empirical one since there are logical and theoretical bases for causation running both ways and what is important is which variable is dominant (assuming that the endogeneity argument is rejected along with the monetary approach). It would have been possible, at this stage. to actually test for causality using the methodology developed by Sims (1972) and Pierce (1977). Causality testing is a relatively recent development in econometrics and much of the empirical work has examined the relationship between money and income. [64A] However, there have also been several historical applications of the methodology, by Brillembourg and Khan (1979), Eichengreen (1980), Hatton, Lyons and Satchell (1981) and Frenkel (1978), although only the latter is of direct relevance, since it specifically examines the exchange rate-price relationship in 1921-25. Unfortunately, Frenkel presents only his conclusions and not a detailed account of his tests (because the sub-section concerned only constitutes a small part of a much broader paper). Nevertheless, it should be acknowledged that his results indicated that causation seemed to run from exchange rates to prices (although his choice of price indices can be and has been criticised above). This conclusion is discouraging (from the point of view of the present study) and more pessimism is generated by the empirical work of Major (1979) who examined the 1971-78 period and found no evidence of a causal relationship between prices and exchange rates.

However, whether or not conclusions based on these results
can command any general acceptance is debateable since the extent
to which any degree of confidence can be placed in the "science" of
causality testing is rather dubious. There is an initial problem of
providing a suitable definition of causality in either a philosophical
or operationally useful sense. [64B] The usual approach adopted is
that of Granger who defined causality in terms of predictability:
X "causes" Y if present Y can be better predicted by using past
values of X than by not doing so (with all other available information,
such as past values of X, also taken into account in either case). More-
over, even if this is accepted, and it may not be, [64C] then the statistical
tests for "Granger causality" have, in their turn, also been controversial.
The two types of test developed, by Sims (1972) and Pierce (1977) using
regression and cross-correlation methods respectively, have been heavily
criticised in terms of both their validity as tests of causality and
the difficulties involved in their implementation. [64D] Consequently,
scepticism about causality testing is widespread and it has not been
adopted as a general practice.

Of course, it remains desirable in principle to test initially
for causality, particularly for the exchange rate-price relationship
examined here, but also more generally because of the force of the
argument that "correlation does not imply causation". [64E] However,
in eschewing the use of causality tests in the present study, it might
be argued, at the one level, that such an approach is following (extremely)
well trodden ground in empirical work and, at another (more fundamental)
level, that the controversy surrounding such tests, along with the
difficulties in definition, interpretation and implementation, mean
that the results generated may well be so conditional (in definitional

and technical senses) as to be worthless or may quite likely be simply inconclusive.   As one study observes:

> "It has, in fact, become a common feature of causality testing that no causality is found". (64F)

Consequently, since evidence of causation would be generated by a dubious methodology and lack of such evidence may indicate more about this methodology itself rather than causality, it seems probable that causality testing can be rejected without undue concern.

In any case, the specific question of the direction of causation between exchange rates and prices loses some importance in the present study to the extent that the hypothesis being tested is whether exchange rates were determined by "economic fundamentals" in the 1930's, only one of which was relative prices.   Furthermore, even if there is really an equilibrium rather than a causal relationship between relative prices and exchange rates (as the monetary approach argues), provided that there is some correlation between the two then this would indicate that this equilibrium "held" in the 1930's and hence indirectly suggest that exchange rates (and relative prices) were not subject to erratic movements but were determined by the

exogenous economic variables. Such a conclusion would be sufficient
to question the hypothesis that exchange rates were determined by
erratic speculative forces in the 1930's (which is principally
what is being examined).

Finally, whilst it is true that in most cases depreciation and
rising prices occurred more or less simultaneously in the 1930's, the
former can arguably be better viewed as permitting the latter rather
than causing them. Specifically, if a policy of deflation was
required to maintain the gold standard parities in the gold bloc
countries, then it follows that if prices had not been held back the
gold bloc exchange rates could not have been maintained and would have
been depreciated; hence price levels determined exchange rates. Once
the decision to abandon the gold standard was taken in these countries
prices were allowed to rise. However, it was not the depreciations
that cause prices to rise but rather the upward pressure on prices
(in the sense of pressure against further deflation) that forced the
exchange rates to be devalued and depreciate.

(IV)

Having considered the theoretical problems associated with PPP
it is now necessary to examine the major empirical problems involved
in testing the hypothesis. In fact these are not exactly the same
for the two versions of the hypothesis: use of relative PPP avoids
some of the problems of the absolute version but creates some new
difficulties of its own. As the present study (like most others)
tests the relative version, the problems peculiar to absolute PPP
can be dealt with fairly briefly. The first of these involves various

exogenous economic variables. Such a conclusion would be sufficient to question the hypothesis that exchange rates were determined by erratic speculative forces in the 1930's (which is principally what is being examined).

Finally, whilst it is true that in most cases depreciation and rising prices occurred more or less simultaneously in the 1930's, the former can arguably be better viewed as permitting the latter rather than causing them. Specifically, if a policy of deflation was required to maintain the gold standard parities in the gold bloc countries, then it follows that if prices had not been held back the gold bloc exchange rates could not have been maintained and would have been depreciated; hence price levels determined exchange rates. Once the decision to abandon the gold standard was taken in these countries prices were allowed to rise. However, it was not the depreciations that cause prices to rise but rather the upward pressure on prices (in the sense of pressure against further deflation) that forced the exchange rates to be devalued and depreciate.

(IV)

Having considered the theoretical problems associated with PPP it is now necessary to examine the major empirical problems involved in testing the hypothesis. In fact these are not exactly the same for the two versions of the hypothesis: use of relative PPP avoids some of the problems of the absolute version but creates some new difficulties of its own. As the present study (like most others) tests the relative version, the problems peculiar to absolute PPP can be dealt with fairly briefly. The first of these involves various

index number problems. In practice these are usually minimized by
using a Fisher ideal index but, in fact, as far as relative PPP is
concerned, such problems are not relevant since it is changes in
prices that are being considered and therefore there is no reason
why using indices with different goods and different weights for
different countries should lead to problems provided the method of
constructing the index does not change in the period under considera-
tion.

The two other problems which are normally associated with absolute
PPP, although when expressed in terms of changes are equally applicable
to relative PPP, involve distortions created by transport costs and
trade controls. These have already been discussed in theoretical
terms and are well known: if transport costs are higher in one direc-
tion than another or a country has higher tariffs than others then
this would create deviations from PPP. In an empirical situation,
such deviations would have to be allowed for. However, to the extent
that these two variables remain at the same level as they were in the
base period, they can be ignored in tests of relative PPP in much the
same way as index number problems but, on the other hand, if they do
change then they will cause distortions. In a test of relative PPP
over a period of only eight years, the assumption that deviations
caused by changes in transport costs can be ignored, does not seem
too objectionable, especially as their importance even in tests of absolute
PPP   is likely to be minimal (except in extreme cases). Unfortu-
nately, this is not true of trade controls which certainly did change,
in fact, dramatically so. The empirical implications of this (and
attempts to deal with it) are taken up in chapter four below.

Thus, with one notable exception, the problems associated with absolute PPP can be ignored in the present study. However, this still leaves one major problem associated with both versions of PPP - the choice of price index - and another, associated solely with relative PPP, namely the choice of base period, which obviously do have to be considered in some detail.

Taking the latter problem first, the base period should be one in which the exchange rate is at its long run equilibrium - that is when absolute PPP holds:

> "Using a base period for which this was not the case can cause serious problems of interpretation in empirical studies. A finding that the change in the exchange rate between two periods was only a fraction of the relative change in the price levels of two countries could constitute positive evidence of a dynamic movement towards purchasing power parity if the base period exchange rate was not equal to its PPP equivalent. On the other hand, if the results showed the exchange rate offsetting perfectly movements in the price levels we might wrongly infer that PPP was being maintained when in fact slow adjustments were keeping the exchange rate away from its PPP path". (66)

It is also preferable for the base period to be fairly close to the current period; how close is "fairly" is, of course, a matter of judgement but the greater the time span between base and current period the more likely are trade restrictions, transport costs, productivity levels and any other potential sources of bias to have changed. (Yeager talks of the "attenuated meaningfulness of price level comparisons over long spans of time".[67])

This may provide the source of the first major problem in that these two criteria - an equilibrium and recent base period - may conflict; the most recent period in which the exchange rate was at an equilibrium level may be some time past. This means that in taking a rather distant

base period the PPP calculation becomes prey to all the various

biases mentioned above. This is Yeager's "ancient history" argument:

> "What may have happened in the years since the base
> period is hardly more than ancient history with respect
> to forces currently determining the exchange rate". (68)

Nevertheless, it remains relatively easy to define conceptually

what a base period should be. However, actually choosing one em-

pirically is a rather different matter. In a sense, the ability to

choose correctly a base period actually precludes the need for relative

PPP in that a correct choice implies that we know how to recognise

whether actual and equilibrium exchange rates are diverging so why

bother to calculate PPP to work out something we already know? Of

course, in reality, the closest we are likely to be able to get to

identifying an equilibrium base period is an approximation where the

actual and equilibrium exchange rates did not diverge too much. Given

this, three possible approaches could be suggested as practical methods

of selecting a base period for empirical work: first, several different

base periods could be tried and a kind of sensitivity analysis could

be applied to see if this made much difference to the results but this

is rather messy and in any case we still need criteria for deciding

which periods qualify as potential bases; also, if we find that the

different bases all generate similar results does this mean that they

are all suitable base periods or that they are all unsuitable?

A second method is suggested by Officer who is highly critical

of the arbitrary way in which most researchers choose their base period:

> "...the rationale of selecting a period in which the exchange
> rate is in long run equilibrium is generally ignored. In
> particular, no researcher has used balance of payments data
> (or apparently any quantitative data) to determine an optimal
> base period". (69)

The possibility is taken up and discussed by Artus:

> "Such an identification /of an appropriate base period/
> can possibly be made by looking at the current balance.
> If the current balance was at a 'satisfactory' level
> given the relative cyclical position of the country, the
> existence of other temporary factors, and account being
> taken of possible lagged effects of past relative price
> changes which are still in the pipeline, then, perhaps, the
> actual rate was close to the /equilibrium/ rate". (70)

This is conceptually a very appealing approach and is further dis-

cussed below.

A third method of choosing the base period has been suggested

by Genberg:

> "By making the assumption, admittedly not unobjectionable,
> that PPP holds on the average during the particular sample
> period, I could let a constant term determine the appropriate
> base period". (71)

This is superficially appealing in that the base period is indeed a

period rather than a single year or (at best) a few years; by, in a

sense, relying on the law of averages, this method also has the

advantage of avoiding the possibility of being completely wrong,

inherent when a base year is chosen arbitrarily. Unfortunately, as

Genberg himself points out, this method is "not unobjectionable"

especially if the period under consideration is a fairly turbulent

one or contains a large sub-period clearly characterised by dis-

equilibrium exchange rates. However, this remains an empirically

easy approach, although the Officer balance of payments method is

perhaps the most appealing.

Unfortunately, the latter may be difficult to apply in practice.

Even adopting Artus' (1978) suggestion and concentrating solely on the

current account, there is an immediate practical problem relating to

whether or not the base year, for the pound-dollar exchange rate,
for example, should be chosen with reference to current account
dealings between Britain and the U.S.A. only. If it is, then power-
ful third country influences which may have pulled the pound-dollar
rate away from its equilibrium (PPP) value are ignored; if it is not,
and the complete current account of each country is examined, then it
may be that the years in which the British current account was
"satisfactory" (and which therefore qualify as suitable base periods)
do not coincide with those suggested by examining the U.S. current
account.

There is also, in the context of the present study which adopts
an extended PPP (or total balance of payments) approach, a more funda-
mental criticism which also applies to Artus' suggestion, referred to
above (that the equilibrium period can be defined with reference to a
"satisfactory" current account). This relates to the contention that
the equilibrium exchange rate should not be calculated solely with
reference to relative prices alone (or the current account only) but
to all the "fundamental" economic variables that determine exchange
rates (or the balance of payments as a whole). Use of the current
account only may be acceptable if a pure PPP hypothesis is to be
tested but, in an extended version, equilibrium not only depends on
relative prices but also relative incomes and, if the capital account
is incorporated, interest rate differentials and various other variables.

Thus, the contention that a particular period is unacceptable
as a base period because the exchange rate was not at its equilibrium
level in terms of relative prices, is inappropriate in an extended
PPP approach if such deviation was justified by the levels of the
variables used to "extend" the PPP hypothesis. Consequently, the widely

held belief that the pound was overvalued in the late 1920's[72] may
not necessarily preclude the use of this period as a base in the
present study, as in total balance of payments terms (allowing for
the influences of non-price, "fundamental" economic variables) the
pound may, in fact, have been in equilibrium.

An examination of the British balance of payments in the
1927-30 period,[73] during which the pound was allegedly overvalued
bears this out. The large trade deficit (over £350m. each year) may
seem to reflect overvaluation in simple PPP terms but the current
account, as a whole, was in surplus (over £100m. except for 1930)
presumably thereby reflecting undervaluation. However, if a total
balance of payments view were taken then this would involve looking
at the capital account also. The net position on current plus capital
account is reflected in gold movements, which were never more than
£15.2m., indicating approximate equilibrium in all four years. A
basic balance approach would involve treating short term capital as
accommodating and concentrating on the current account plus long term
capital only which would indicate a balance of payments position of
-£35.9m. in 1928, +£12.0m. in 1929 and -£11.6m. in 1930. (Data on
short term capital was not available for 1927). This would suggest
that either 1929 or 1930 are most suitable as base years for extended
PPP calculations against the pound, although in the light of the
arguments in the previous paragraph, this is only really true for
the pound's effective exchange rate and not its bi-lateral rates.

Furthermore, the contention that the British balance of payments
was in equilibrium has, in fact, been strongly made elsewhere:

"If....balance-of-payments equilibrium were the sole
criterion of the equilibrium rate of exchange, there
might be little justification for regarding the pound
sterling in the years 1925-30 as overvalued. For there
was little sign of disequilibrium in the British balance
of payments. The Bank of England's gold reserve remained,
on balance, practically constant during those six years..." (74)

Moreover, the same author goes on:

"If we apply our definition of the equilibrium rate literally,
the pound cannot be said to have been overvalued. The British
balance of payments was kept in equilibrium, however, only at
the cost of depressed conditions at home compared with conditions
in the outside world". (75)

Thus although the pound may have been overvalued in a "pure" PPP

sense, if allowance is made for other economic fundamentals, particu-

larly relative incomes, it is possible to argue that the pound was at

an equilibrium level in a total balance of payments sense.(76)

Additional and perhaps more useful evidence (since it applies

to five of the seven currencies in the present study and not just the

pound) is provided by Gaillot (1970). He attempts to calculate whether

PPP held over a very long period (1900-04 to 1963-67) for the exchange

rates of seven currencies against the dollar and examines a number of

intermediate periods, including 1927-31, in which he finds that the

actual exchange rates of the U.K., Canada, France and Switzerland

were all within six per cent of their PPP rates.(77)

Thus, there is reason to believe that the pound, and possibly

some of the other currencies in the study, were in equilibrium in a

total balance of payments sense in the late 1920's. Furthermore,

identifying a base period in this way does not preclude the simul-

taneous adoption of Genberg's approach of including a constant. The

The implied assumption of PPP holding on average in the 1930's may be

a heroic one but is not totally without foundation as, for example,

contemporary calculations of simple PPP of the major currencies
identified periods of both over and undervaluation of the pound
and the dollar.[78] In addition using two methods of determining
the base year - and equilibrium balance of payments approach and
inclusion of a constant term - make it more acceptable to adopt a
common approach to all the exchange rates examined (which is what is
actually done), thereby avoiding the conceptually correct, but em-
pirically messy, possibility of having to use different base periods
for different bi-lateral exchange rates.

A more general problem, which applies equally to both absolute
and relative PPP, relates to the choice of type of price index and
many studies would seem to adopt a haphazard approach to this, often
not discussing it at all. A variety of indices have been used - whole-
sale prices, cost of living indices, export prices, unit factor costs,
wages, the GNP deflator and several others. There are two stages in
the choice of index decision: firstly, the question as to whether the
index should be biased towards traded goods, non-traded goods or be
simply a general index and secondly, having chosen the type of index,
what are the advantages and disadvantages of the available indices of
that type?

If PPP is construed as being based solely on commodity arbitrage
then it has been argued[79] that there is no reason why the "law of
one price" should apply to non-traded goods - indeed there is a good
reason why it should not in the form of the productivity bias argument -
and consequently an index based on the prices of traded goods is what
is required. This line of argument could be used to justify the wide-
spread use of wholesale price indices in empirical work (although lack
of available alternatives may be a much more important reason for this).

However, reliance on indices based only on the prices of traded goods may have its pitfalls; in particular, the short run price of exports may be set more with current competitiveness in mind than overall domestic cost and price levels, and so their reliability as indicators or PPP and therefore equilibrium exchange rates may be very limited.

More fundamentally, even if the "law of one price" does hold for tradeables, PPP based on a traded good prices index is simply a truism. As Haberler notes:

> "...equality of international prices....is a necessary but clearly not a sufficient condition for international equilibrium. Even if there exists a large and prolonged deficit in a country's balance of payments and hence its currency is seriously overvalued, prices of internationally traded goods will not, or at least need not, show any deviation from purchasing power par". (80)

Verification of PPP based solely on price indices of traded goods is therefore spurious and this was very quickly realised by Keynes who used this argument to attack the British return to gold in 1925 at the old parity which, insofar as it was based on any rational economic argument, stemmed from a PPP calculation based on wholesale price indices (which are heavily weighted with traded goods).

If one rejects commodity arbitrage as the principal mechanism linking prices to exchange rates or, perhaps better, accept its role as far as traded goods are concerned but dismisses the fact that the law of one price holds as self-evident and therefore trivial, and instead emphasizes the role of equilibrium in asset markets then a more general price index is preferred. If this view is taken to its logical conclusion and it is argued that the law of one price is automatic, then what is really required is an index of the prices of non-

traded goods. The favourite choice is usually some index of wages.[81]

An alternative rationale, more in keeping with the traditions of commodity-arbitrage PPP, is that in the absence of any biases in the internal price ratio (non-traded to traded goods) then a general price index is preferable since it avoids the criticism of spurious verification, allows emphasis to remain on commodity arbitrage and the asset market approach to be rejected and is much more in keeping with Cassel's own views since when he wrote about "the internal purchasing power against goods"[82] he quite clearly meant all goods:

> "Some people believe that Purchasing Power Parities should
> be calculated exclusively on price indices for such
> commodities as form the subject of trade between the two
> countries. This is a misrepresentation of the theory....
> the whole theory of purchasing power parity essentially
> refers to the internal value of the currencies concerned,
> and variations in this value can be measured only by general
> index figures representing as far as possible the whole mass
> of commodities marketed in the country". (83)

Emphasis on commodity arbitrage still remains at the centre, however, since an essential ingredient of Cassel's theory is that the prices of traded and non-traded goods are closely related by various links:

> "Actually, the line between domestic and internationally
> traded goods is a fuzzy and shifting one. Various domestic
> and international goods and services are related in price,
> though not rigidly, by the fact that some are ingredients
> of others, by the use of common factors of production, and
> by direct or indirect substitutability in consumption". (84)

Thus, if we are to provide a genuine test of PPP - certainly of the version expounded by Cassel - then a general price index is to be preferred. In addition, such an index would also be preferred by exponents of the asset market theory of exchange rate determination and consequently, its acceptability to both PPP and asset market

theorists make it particularly appropriate for an eclectic approach
of the kind adopted here.

Turning to the specific choice of index, it remains true that,
in spite of all the above rhetoric, one of the most popular indices,
albeit often due simply to availability, has been a wholesale price
index which would normally be regarded as an index of traded goods
prices; consequently, initially some examination of such indices
must be made in passing if much of the empirical evidence is not to
be ignored. Not surprisingly wholesale price indices (WPI's) often
perform better than any others, although whether any weight can be
given to the argument that if we are interested in simply predicting
exchange rates, rather than testing the PPP hypothesis then WPI's are
better practical indicators due to their "higher explanatory power",[85]
and that therefore their use is justified, rather depends on one's
views about the direction of causality between prices and exchange
rates.

Of the indices which contain mostly traded goods WPI's are per-
haps the least objectionable in that they do contain some non-traded
goods. However, they are still heavily biased towards tradeables
largely because they concentrate mainly on commodities; the tendency
to spuriously support PPP is accentuated by the fact that they often
give relatively large weights to primary products (which tend to obey
the "law of one price") and omit altogether highly differentiated
products (which do not). There are also statistical difficulties of
comparability due to differences in coverage and weighting of national
WPI's (although this is more a problem for absolute than relative PPP).
Whether or not the OPTICA conclusion - that it is "legitimate, though
not ideal, to consider WPI a useful candidate series for measuring PPP"[86]

is acceptable is perhaps questionable. Finally, at least one study[87] has tried indices based completely on traded goods in the shape of indices of export prices which (not surprisingly) performed very well. However, this type of index provides such a biased test of PPP that these results can be taken as little more than the result of efficient commodity arbitrage.

The most popular of the more general indices have been consumer price indices (CPI's) which, of course, are not subject to the conceptual objections that plague WPI's although they can be criticised for lack of comprehensiveness; in 1970 private consumption represented less than two-thirds of GDP in most major developed countries. Nevertheless, as far as testing the PPP hypothesis is concerned CPI's are without equal in practical terms since they are widely available and not especially biased towards traded goods. Moreover, criticism of their lack of comprehensiveness is, to some extent, a red herring since all the available indices are subject to statistical shortcomings of one sort or another and it is rather too easy for a supporter of a particular index to begin justifying his choice by pointing out the statistical weaknesses of the alternatives.

However, the index that is most widely recognised as being the "best" of the general price indices for PPP purposes is the GNP or preferably GDP price deflator:

> "Of the three /WPI, CPI and GDP deflator7, the GDP
> implicit deflator has the strongest claim to represent
> a general measure of a country's price level. It is
> based on a conceptual framework that assigns an appro-
> priate weight to each good, whatever the classification
> chosen - as for example, between tradeables and non-
> tradeables". (88)

> "...the GDP deflator....is, in the view of some observers,
> the most suitable in measuring PPP, because it is the most
> broadly based". (89)

> "Cassel does not directly identify the kind of general
> price level that would be optimal in computing PPP,
> but the most logical interpretation would be a price
> measure of a country's GDP". (90)

In addition the scope of implicit deflators is likely to be very
similar since they are usually based on a common accounting framework
(the UN System of National Accounts). The major difficulty associated
with the GDP deflator is a practical one in the form of its lack of
availability. Even in more recent times it is often only available
on an annual basis in some countries which may preclude the use of
this rather promising indicator of general price trends. It is for
this reason - especially for pre-World War 2 periods - that CPI's
are usually the least objectionable of the available general price
indices.

An alternative method of testing PPP is not to use price indices
per se but to use indices of costs because they give a much better
indication of the true underlying level of prices for two main
reasons:

> "Arguments in favour of cost over price parity theories....
> are outlined as follows.(1) Costs of production are less
> subject to adjustment to exchange rate changes than are
> prices of traded goods. (2) Costs exclude the volatile
> component of profits and so are more likely than product
> prices to represent long-run prices (for absolute parity)
> and to reflect permanent rather than temporary changes in
> prices upon inflation or deflation (for relative parity)". (91)

However, as Officer goes on to point out, it should be noted that such
arguments "do not justify a cost parity as such, only its superiority
in certain respects over a price parity"[92] and so all the theoretical

> "...the GDP deflator....is, in the view of some observers,
> the most suitable in measuring PPP, because it is the most
> broadly based". (89)

> "Cassel does not directly identify the kind of general
> price level that would be optimal in computing PPP,
> but the most logical interpretation would be a price
> measure of a country's GDP". (90)

In addition the scope of implicit deflators is likely to be very
similar since they are usually based on a common accounting framework
(the UN System of National Accounts). The major difficulty associated
with the GDP deflator is a practical one in the form of its lack of
availability. Even in more recent times it is often only available
on an annual basis in some countries which may preclude the use of
this rather promising indicator of general price trends. It is for
this reason - especially for pre-World War 2 periods - that CPI's
are usually the least objectionable of the available general price
indices.

An alternative method of testing PPP is not to use price indices
per se but to use indices of costs because they give a much better
indication of the true underlying level of prices for two main
reasons:

> "Arguments in favour of cost over price parity theories....
> are outlined as follows.(1) Costs of production are less
> subject to adjustment to exchange rate changes than are
> prices of traded goods. (2) Costs exclude the volatile
> component of profits and so are more likely than product
> prices to represent long-run prices (for absolute parity)
> and to reflect permanent rather than temporary changes in
> prices upon inflation or deflation (for relative parity)". (91)

However, as Officer goes on to point out, it should be noted that such
arguments "do not justify a cost parity as such, only its superiority
in certain respects over a price parity"[92] and so all the theoretical

criticisms applying to price parities apply with equal force to
cost parities. Indeed Houthakker has presented a cost parity theory
which reduces to a price parity theory although this has been strongly
criticised on theoretical and other grounds.[93] However, there is
one factor in favour of the cost parity approach in that the reverse-
causation argument - that exchange rates determine prices - loses
much of its force when applied to cost levels instead of price levels.

Nevertheless, while it has advantages, the cost parity approach
could be viewed rather negatively as having all the disadvantages of
the price parity approach plus one or two others. In particular the
"cost level" is a vague and ambiguous concept and to make it opera-
tional even at a theoretical level several problems have to be dealt
with: for example, a firm's costs vary with its level of output which
means that an appropriate output level has to be chosen at which to
measure costs and furthermore costs may not even reflect long run
prices if there is an element of oligopoly or monopoly in an industry;
at a more practical level the specific firms and industries to be
included in the cost index have to be chosen and in addition allowance
must be made for differences in long run productivity growth across
countries.[94]

Finally, there is the problem of availability of data. The
only factor price that is readily available is that of labour and
consequently prices of intermediate inputs, capital services and
raw materials have to be excluded. Frenkel (1978) does try an index
of material prices with some success but this can be criticised on
exactly the same lines - it excludes everything else; moreover, since
raw materials often consist of primary products which are not differen-
tiated then they are very likely to obey "the law of one price" and

hence provide a biased test of PPP. In any case, reliable indices
of labour costs are not always widely available:

> "The use of unit labour costs (ULC) would appear to....
> /be an appropriate choice/....But again there are
> statistical...causes for unease; in particular the
> quality of the available statistics is suspect. Indirect
> labour costs such as pay-roll taxes and unemployment
> insurance are largely excluded; for two EC /European
> Community/ countries ULC data do not exist at all, while
> for four other EC-countries they are not published
> nationally". (95)

Thus use of cost parity either to represent or provide an alternative
for price parity must ultimately be rejected in most cases simply due
to lack of data.

With regard to the present study data deficiencies mean that
use of cost indices is simply not possible (with one exception)
and consequently use must be made of whatever price indices can be
found. In practice GDP deflators are obviously not available either
for the 1930's, but fortunately WPI's and CPI's usually are, which
at least allows the study to try both a traded good biased index,
based on WPI's, thereby providing comparability with many other
studies, and a more general index, which provides a much better
test of PPP (although, of course, the study is concerned with rather
more than this).

(V)

This completes the survey of PPP and the problems associated
with its application. Its widespread acceptance and application make
it a useful starting point for any theory of exchange rate determina-
tion. However, its implicit concentration on the current account make

it necessary to examine other theories and various elements of
these can be usefully drafted on to produce an extended PPP
hypothesis which adopts an eclectic (and more acceptable) view of
exchange rate determination. The theoretical and practical problems
associated with PPP are substantial but not completely insurmountable.
Having surveyed the theoretical aspects of exchange rate determination,
the next chapter examines some of the empirical work concentrating
especially on studies which adopt some form of PPP approach and (or)
deal with past periods of floating exchange rates (particularly the
inter-war period).

FOOTNOTES TO CHAPTER 2

1. R. Dornbusch and P. Krugman: "Flexible Exchange Rates in the Short run" (Brookings Papers in Economic Activity, No. 3, 1976, pp. 537-84) p. 540.

2. J. Wheatley: "Remarks on Currency and Commerce" (1803) and "An Essay on the Theory of Money and Principles of Commerce" (1807). For Ricardo's contribution see E.C. Connor (ed.) : "Economic Essays by David Ricardo" (1970). For an attempt to trace the origins of PPP even further back - to Spanish writers in the sixteenth and seventeenth centuries - see P. Einzig, "The History of Foreign Exchange", (1970).

3. See Holmes (1967) and Officer (1976a) for a more complete bibliography of Cassel's contribution.

4. See, for example, Einzig (1935), F.W. Taussig, "International Trade" (1927) Ch. 6, J. Viner, "Studies in the Theory of International Trade" (1937) and the work of X. Zolotas (discussed below).

5. See Balassa (1964) and Kravis and Lipsey (1978), for example.

6. Many authors suggest this - for example, Samuelson (1964) - and the point will be taken up further on.

7. This line of argument is taken up by Frenkel (1978) p. 188 : "The relationship embodied in the traditional formulations of PPP should not be viewed as a theory of the determination of exchange rates".

8. Cassel (1918) p. 413.

9. Officer (1976a) pp. 2-3.

10. Yeager (1976) pp. 211-2.

11. Yeager (1958) p. 516.

12. Ibid, p. 519.

13. See Cassel (1922) pp. 147-62.

14. Cassel (1918) p. 413.

15. Cassel (1922) p. 148.

16. See Kalamatousakis (1978) for a discussion of the work of Zolotas in the inter war period: "As a result /of these other factors/ the price of foreign exchange can exhibit wide variations regardless of the purchasing power that it represents. This view is also accepted by Cassel, but he argues that the influence of the factors mentioned above is temporary and cannot last more than a year" p. 165.

17. Cassel (1922) pp. 149-50.

18. Ibid, p. 150.

19. Ibid, pp. 150-4.

20. G. Cassel : "Foreign Investments" (1928) pp. 16-17 (quoted in Holmes, 1967, p. 690).

21. G. Cassel : "The Theory of Social Economy" (1932) p. 679 (quoted in Holmes, 1967, p. 689).

22. Cassel (1922) p. 150.

23. Ibid, pp. 154-6. This possibility is discussed at length in a later section in the form of the productivity bias argument.

24. See Aliber (1962), Grissa (1967), Nurkse (1944) and Tsiang (1959).

25. Schadler (1977) p. 281.

26. Isard (1978) p. 9.

27. Ibid, pp. 16-18.

28. It should, however, be pointed out that the asset approach would take the view that expectations were rational (and correct) whilst the speculative run view would seem to suggest that they were irrational.

29. Isard (1978) p. 17.

30. See Frenkel and Levitch (1975) for a summary.

31. Risk, in general, and fear of exchange controls, in particular, are stressed by Aliber (1973).

32. See Isard (1978) p. 16.

33. Artus (1978) p. 289.

34. See, for example, J. Tobin, "The Theory of Portfolio Selection" in F. Hahn and F.P.R. Brechling (eds.), "The Theory of Interest Rates" (1965).

35. Batchelor (1977) p. 55.

36. Artus (1978) p. 280. See Frenkel and Johnson (1978) and the articles contained in the Scandinavian Journal of Economics Vol. 78, No. 2, 1976 for numerous expositions and tests of the asset approach.

37. Batchelor (1977) p. 280.

38. Frenkel (1976) p. 200 (Abstract).

39. Mussa (1976) p. 231.

40. See ibid p. 237 for a discussion of this. It should be noted, however, that the postulated effect of real incomes on exchange rates is not through a change in demand for imports (and hence foreign currency) as in the model developed here, but via the effect of income changes on the demand for money; this difference actually leads to different expected signs on the income variables to those suggested in chapter four.

41. Lindbeck (1976) p. 136.

42. It should be noted that these two variables have different expected signs to those suggested in the model developed here.

43. Artus (1978) p. 283.

44. Batchelor (1977) p. 54.

45. Ibid, p. 45.

46. Frenkel (1980a) p. 238.

47. In high periods of unemployment when prices were stable or falling it is reasonable to argue that a change in the money supply would have a greater (or at least some) influence on output and employment than on prices. This certainly seems to have been the case in 1932-37 in Britain when there was a sharp recovery in UK GNP at (fairly) constant prices during a period of cheap money and a distinctly rising monetary base and money stock. Moreover, there is sufficient doubt about the validity of monetarism in general to preclude taking a wholly monetary view of exchange rate determination.

48. Cassel, himself was not unaware of this problem and the solution ultimately adopted here is, in fact, that suggested by Cassel (and already discussed earlier in the chapter).

49. See E.E. Hagen, "Comment" in "Problems in the International Comparison of Economic Accounts" (1957) pp. 377-88 and "Some Facts about Income Levels and Economic Growth", Review of Economics and Statistics, Vol. 42, 1960 .

50. See W. Beckerman, "International Comparisons of Real Income" (1966) p. 25.

51. This correspondance would be exact under the assumption that prices equal marginal costs.

52. Balassa (1964) p. 586.

53. Officer (1976b) p. 569.

54. Officer (1974). See Officer (1976a) for a summary of the argument.

55. J.P. Delahaut and E.S. Kirschen, "Les revenus nationaux du monde non communiste", Cashiers Economiques de Bruxelles, No. 10, April, 1961.

56. J. Grunwald and J. Salazar-Carrillo, "Economic Integration, Rates of Exchange, and Value Comparisons in Latin America" in D.J. Daly (ed.) "International Comparisons of Prices and Output" (1972).

57. According to Officer (1974) pp. 874-5, this actually invalidates
     Balassa's test.

58. Yeager (1976) p. 223. See Officer (1976a) p. 17 for a list of
     exponents of this argument.

59. Yeager (1976) p. 224.

60. Ibid., p. 225.

61. This argument is also put forward by Sohmen (1969) pp. 172-3.

62. See, for example, Brittan (1970), Einzig (1970), Roosa in Friedman
     and Roosa (1967) and Nash in Johnson and Nash (1969).

63. However, it is only fair to say that such an argument is not
     completely untenable by any means. For example, in the 1979-81
     period, the strong pound no doubt held import prices and hence
     the general rate of inflation down to some extent.

64. Economist 11/5/35 pp. 1062-4.

64A. For example, Sims (1972) for the U.S.A., Williams, Goodhart and
     Gowland (1976) for the U.K. and Brillembourg and Khan (1979) for
     a historical treatment of the U.S.A.

64B. See Zellner (1979) pp. 12-21, for a discussion of this.

64C. See ibid., pp. 30-35.

64D. Pierce's test is criticised in Schwart (1979), pp. 79-81, and
     Sims (1979), p. 106, and Sims' test by Jacobs, Leamer and Ward
     (1979) who go on to criticise causality testing in general.

64E. Jacobs, Leamer and Ward (1979), p. 401.

64F. Hatton, Lyons and Satchell (1981), p. 12.

65. See the Statist 15/6/35 p. 997 :"The recent devaluation of the
     /Belgian/ currency is regarded as an effective increase in the
     tariff, the rates of which are therefore undergoing an offsetting
     reduction".

66. Genberg (1978), pp. 263-4.

67. Yeager (1976), p. 223.

68. Yeager (1958), p. 517.

69. Officer (1976a), p. 53.

70. Artus (1978), p. 286.

71. Genberg (1978), p. 264.

72. For example, see the Economist 26/9/31 p. 551 and 18/11/33 pp. 948-9.

73. The data discussed is that provided by Chang (1951) p. 144ff.

74. Nurkse (1944), p. 125. See also Nurkse (1945), p. 6.

75. Nurkse (1945), p. 7. See also Nurkse (1944), p. 126.

76. Whether or not this was bought at the expense of an unacceptable degree of internal imbalance is another question.

77. See Gaillot (1970) Table 2, p. 352.

78. For example, see the Economist 30/5/36, p. 492.

79. This is not how Cassel saw things; his view will be outlined shortly.

80. Haberler (1961), p. 49.

81. An alternative rationale for using an index of wages is the theory of cost parity as opposed to, or perhaps as a proxy for, price parity; this is discussed below.

82. Cassel (1918), p. 413.

83. G. Cassel : "Post-war Monetary Stabilisation" (1928), p. 33 (quoted in Frenkel, 1978, p. 172).

84. Yeager (1958), p. 522. A number of additional channels through which the prices of traded and non-traded goods are related are given in Batchelor (1977), p. 46.

85. This is the reason why the OPTICA reports (discussed in Genberg, 1978) favoured wholesale prices.

86. Thygesen (1978), p. 304.

87. Ibid., pp. 303-7.

88. Kravis and Lipsey (1978), p. 200.

89. Thygesen (1978), p. 303.

90. Officer (1976a), p. 6.

91. Officer (1974), p. 10.

92. Ibid.

93. Ibid., p. 57 for references and ibid, pp. 11-13 and p. 23 and Samuelson (1964), pp. 149-51 for criticisms.

94. This is the Balassa productivity bias argument again, discussed in this context by Officer (1974), p. 26.

95. Thygesen (1978), p. 305.

CHAPTER 3

EMPIRICAL STUDIES OF EXCHANGE RATE

DETERMINATION

(I)

The widespread adoption of floating exchange rates in the
1970's has led to a growth of interest in the performance of floating
rates and has consequently generated a large number of empirical
studies. Clearly it is not possible to survey all the literature
nor is it necessarily desirable to do so since in many cases the objec-
tives differ to those of the present study - for example, an author
may be seeking to provide evidence to support or discredit a particular
theoretical approach - or the period being examined may not be partic-
ularly relevant in the context of the 1930's. In connection with the
latter point, an observation made by Yeager (1969) is perhaps in-
structive:

> "...we must beware of excessive generalization about the
> lessons of historical experience with fluctuating exchanges.
> Superficially similar experiences may be fundamentally
> different, even though in ways usually unappreciated and
> requiring detailed, episodic study. When tempted to draw
> lessons from experience we should make sure we understand
> just what the experience was of". (1)

The present study does not seek to test any particular theory in
the normal sense - it is not concerned with providing support (or lack
of it) for a pure PPP hypothesis or an asset market (or monetary)
approach, but instead it attempts to be eclectic because the focus of
interest is really on two rather basic (or even crude) and connected
questions. Firstly, to what extent were exchange rates "stable" in

the 1930's in the sense of being determined by "economic fundamentals" and secondly, to what extent were they "unstable" in that they deviated from the equilibrium path indicated by these "economic fundamentals"; this second question involves the question of the importance of destabilising speculation. Consequently the studies to be examined will be those that address themselves to these problems.

Returning to the question of the relevance of the performance of exchange rates during different historical periods, there are basically four periods in which exchange rates have floated and hence which have provided data for examining the determinants and stability of floating exchange rates: firstly, there are a few studies of the pre-World War 1 years although these are obviously hampered by data deficiencies; secondly, the inter-war years (particularly the early 1920's) have attracted some interest; a third period is the 1950's during which the Canadian dollar was floating (arguably providing the only example of floating during a "normal" period); finally, the adoption of floating rates in the 1970's has obviously led to a large number of studies which examine the current period.

It is conventional to talk in terms of drawing from historical experience to shed light on contemporary events. In the present context it is rather the other way round in that part of what follows involves examining contemporary experience with a view to deciding whether this can shed any light on events in the 1930's. However, mindful of Yeager's comments (above), it is proposed to only briefly survey the experiences of the 1970's, the 1950's and the pre-1914 period and concentrate mainly on the empirical evidence relating to the inter-war period.

(II)

In this section the empirical evidence relating to the pre-World War 1 period, the 1950's and the 1970's will be briefly discussed. Empirical studies of the nineteenth century experience of floating exchange rates are scant although such periods did exist, despite the widespread portrayal of this century as the heyday of the gold standard (and fixed exchange rates). The two main episodes which have been examined are the American "greenback" period (1861-79) during which the U.S.A. was effectively on an inconvertible paper standard with a floating exchange rate - the "gold dollar" remained at par but the greenback price of gold fluctuated - and the floats of the currencies of Austria-Hungary and Russia (1879-91).

The latter were examined by Yeager (1969). A PPP calculation suggested that the (Austrian) guilden was strongly related to relative prices and although it was occasionally subject to non-economic factors (including "a weak psychological connection....with the price of silver"[2] and fears of war), it was, on balance, remarkably stable (arguably more so than the Canadian dollar in the 1950's). An important reason for this was arbitrage in international securities.[3] There is no suitable price index for Russia and so a PPP calculation is ruled out but it is clear that the ruble fluctuated much more than the guilden. However, according to Yeager, this was due to "the ruble's greater sensitivity....to the psychological magnification of real influences"[4] including mistrust of official Russian policy (fear of inflation) and the greater likelihood of Russian involvement in wars and he concludes that "...the foregoing points suggest.../that/...the instability of the ruble does not necessarily show that destabilising

speculation ordinarily prevailed in the foreign exchange market".[5]

There are (at least) two relevant studies of the American "greenback" period, one relating to the whole period and the other to a specific incident (the gold crisis of 1869), which is often cited as an example of destabilising speculation. The former study forms chapter two of Friedman and Schwartz (1963) and deals with wider issues, but in the present context, the examination of the PPP relationship in the 1861-79 period and the discussion of deviations from PPP is instructive (pp.61-78). Basically their data suggest that the greenback dollar broadly followed its PPP path throughout the period but was (approximately) 20 per cent undervalued in the 1861-64 period and 10 per cent overvalued in 1865-71 although it was very close to its PPP level in 1873-79.

Nevertheless, these discrepancies do not necessarily furnish evidence of destabilising speculation. In the 1861-64 period speculation (a capital inflow) limited the depreciation and, as after the Civil War the exchange rate did appreciate, "the speculators were ultimately correct and their speculation in retrospect was 'stabilising'".[6] Moreover, although Friedman and Schwartz do not go this far, the continued capital inflow in 1865-71, which caused the greenback to be worth more than its PPP value, could also be interpreted as "stabilising" speculation to the extent that, because the greenback was appreciating (in PPP terms), the capital inflow could be construed as speculators speeding up the adjustment process.

Wimmer (1975) examined the gold crisis of 1869; this involved an attempt to artificially lower the value of the greenback which ultimately backfired and led to the original "Black Friday", (24th Sept.,

1869), a day in which the value of the greenback fluctuated widely.
Wimmer criticises the traditional view that this provides a good
example of the "evil consequences" of floating exchange rates, and
argues that such interpretations are due to "inadequate economic
analysis and lack of empirical examination".[7] Indeed, he goes
much further and claims that the opposite is true. Forcing the price
of the greenback away from its equilibrium level was only made possible,
in fact, by very large purchases of gold dollars and "required the
strong suspicion among private speculators of government complicity".[8]
Furthermore, once the "mistake" was realised, "the market returned to
its previous price and stability with amazing speed".[9] Thus, this
is more an example of stabilising rather than destabilising speculation.

Turning to the 1950's the float of the Canadian dollar is
widely documented and is well-known as a good example of how a floating
exchange rate can be stable and quite free of destabilising speculation.[10]
It is particularly instructive in that it is the only example of floating
which cannot be said to have taken place against a backdrop of uncer-
tainty and international disorder. The conclusion that the Canadian
exchange rate was stable is all the stronger because it is reached by
different authors via different routes. Rhomberg (1960) (1964) uses
a full scale model and ultimately concludes:

> "The model presented in this paper confirms the view that
> in an otherwise stable economic environment unrestricted
> capital movements need not be feared as a source of in-
> stability". (11)

Others estimate a single equation to show that capital flowed in
when the dollar depreciated and out when it appreciated thereby
stabilising it.[12] Two other points are of interest: firstly, the
importance of interest rates in determining the Canadian exchange

rate[13] - these will be included in the model here - and secondly,
the fact that it was private short term capital that stabilised
the exchange rate not official intervention which was of secondary
importance,[14] although it did tend to stabilise the rate (until
1961).

Thus the Canadian dollar in the 1950's provides a good example
of a floating but stable exchange rate which was not subject to de-
stabilising speculation. Before leaving the Canadian dollar an obvious
question must be dealt with: if the Canadian float was so successful
then why was it abandoned in 1961? The answer would seem to lie in
the monetary policy of the Canadian government. In late 1960 the
government engineered a depreciation in an attempt to reduce unem-
ployment and the main reason why the floating rate was abandoned was
because this depreciation got out of control. Basically it was not
floating the exchange rate that caused the problems but the Canadian
government's monetary policy and its attempt to manipulate the exchange
rate:

> "The speculation and crises and alternation of heavy
> gains and losses of external reserves....in the 11 months
> before adoption of the new fixed parity occurred under a
> regime of officially manipulated flexible rates, not of
> free rates". (15)

It is interesting to note that Tsiang in his study of exchange rates
in the early 1920's comes to essentially the same conclusion about the
franc:

> "Thus the instability of the French franc from 1923 to
> 1926 was the result of an extremely elastic money supply,
> which would have caused great instability in the economy
> whether the exchange rate was freely fluctuating or
> controlled". (16)

Consequently, the ultimate return of the Canadian dollar to a fixed value did not reflect failure of the float but rather the government's inept monetary policy.

Before briefly examining the 1970's, reference should be made to two other relevant episodes which have been documented to a lesser extent than those discussed so far. Ford (1958), in a study mainly concerned with balance of payments adjustment, does not appear to have considered that the Argentinian peso was subject to destabilising speculation in the 1885-190ᴜ period and in a detailed study of the Peruvian float (1950-54) Tsiang concludes:

> "From.../1950/...to the end of 1952....the exchange rate ...was remarkably stable...In 1953, however the...rate depreciated by 28 per cent.../but/...Exchange rate stability was restored in 1954....." (17)

Thus the Peruvian exchange rate appears to have been stable in four of its five year float and, in fact, its depreciation in 1953 does not appear to have been associated with speculative factors either:

> "Such evidence as is available....indicates that, on the whole, speculative capital movements during 1953 were on balance not destabilising". (18)

The general conclusion with regard to the 1970's would seem to be that exchange rate movements have been rather more erratic than might have been expected, particularly in the light of the large volume of academic support for their adoption. This was the conclusion reached by a study of the first two years of the 1970's float[19] and subsequent events have tended to reinforce this view. Whether this constitutes evidence of an inherent tendency to "instability" is perhaps debateable. That the float began from a position of disequilibrium is axiomatic; it constitutes one of the main reasons why the fixed exchange

rate system that preceded it collapsed. Proponents of fixed exchange
rates would nevertheless interpret this as history repeating itself
and floating rates being proved "unstable" once again but an al-
ternative view of how history has repeated itself is put forward
by Yeager who argues that the criticisms of the performance of
floating rates "are further examples of something drearily familiar
in monetary history: floating exchange rates, left on the scene after
fixed rates have broken down, are routinely blamed for the economic
disorders that had caused the breakdown and to which the fixed rates
had themselves contributed."[20]

Furthermore, there have been a number of important shocks to
the economic system, particularly the oil price increases and, in the
British context, the impact of North Sea oil. Much can be made of
these factors:

> "floating exchange rates functioned in an environment
> in which fixed rates had broken down and could not have
> been soon restored. The world oil situation brought what
> has been called 'the biggest international financial crisis
> since the 1930's'and the largest structural shift in inter-
> national payments since the German reparation problem after
> World War 1". (21)

The 1970's is also clearly not a period of freely floating rates.
Widespread official intervention (and temporary pegging), the remnants
of Bretton Woods and the existence of one-way speculative options in the
European "snake" have added to the difficulties. To some extent, there-
fore one is justified in concluding that floating rates could not have
been expected to be "stable" in the 1970's.

However, one can go rather further than this, and argue that,
in spite of wide fluctuations, exchange rates have shown some tendency
to be influenced by "economic fundamentals". In particular high inflation

countries have tended to have weak currencies (Britain, Italy) while low inflation economies have tended to have strong ones (Germany, Switzerland); in addition, the role of interest rates as an important influence has been apparent, most recently in the context of the strong U.S. dollar in 1981. More formally, a simple monthly model of the pound-dollar exchange rate estimated for the September, 1975 to June, 1980 period found that British and American (consumer) prices and the interest rate differential were significant determinants of the exchange rate and, in fact, predicted a depreciation of the pound in 1981 (although not to the extent that actually occurred).[22] Other studies, which have examined PPP in the post-war period and have extended as far as 1975, have also produced some support for the hypothesis that exchange rates and prices are related (although the purposes of these studies has not been to examine stability of exchange rates).[23]

Finally, a certain amount of empirical work on the 1970's has gone into exploring the so-called monetary approach to the exchange rate (which can be seen as an asset market approach in which the main asset is money). To the extent that these studies are principally concerned with providing evidence to support the monetary approach, they are of less interest in the present context. However, given that they explicitly use the PPP hypothesis as one of their "building blocks"[24] and that the exchange rate is expressed as a function of relative money supplies, interest rate differentials and levels of real income,[25] the apparent success of these models in empirical tests can be construed to some extent, as providing further evidence of the importance of "economic fundamentals" in exchange rate determination. Monetary models also give an important role to expectations which are

incorporated in the model developed here (in the form of dummy variables).

<center>(III)</center>

The bulk of the evidence relating to periods other than the inter-war years can be interpreted as broadly supporting the hypothesis that floating exchange rates are, to a large extent, determined by "economic fundamentals". However, one must be wary of excessive generalisation and obviously the empirical studies relating specifically to the inter-war years are of most interest. There are a substantial number of studies of exchange rates in the 1920's and rather less of the experience of the 1930's. The classic reference for the period is Nurkse (1944). However, whether or not this can really be called an "empirical" study is debateable.[26] Its conclusions about the performance of floating rates would seem to be based on casual observations and are perhaps better described as assertions. In fact, it is precisely the lack of a sound empirical basis in Nurkse's book which provided the starting point of the present study.

Fortunately, a number of authors have examined the period more thoroughly. The studies can be discussed in terms of the two main strands which they tend to highlight (and are of primary interest in the present context): firstly, the importance of "economic fundamentals" in exchange rate determination and, in particular, the validity of the PPP hypothesis; and secondly, the evidence of destabilising speculation (or lack of it). With regard to the former, the debate over the merits of the PPP hypothesis has carried on at both theoretical and empirical levels for years and has already been discussed in some detail (with

particular reference to the theoretical aspects) in chapter two.
Stolper (1948) was one of the first to examine an episode in the
inter-war period and, using three different price indices[27] to
approximate the PPP of the pound against the dollar (1919-25), he
concludes that the exchange rate was principally determined by
relative prices and any deviation from the PPP rate was usually
due to differences in income levels. Tsiang (1959) also looks at
the pound-dollar exchange in this period and in addition considers
the (Norwegian) kroner-dollar and (French) franc-dollar exchanges.
Only in the case of the French franc does he find large and continual
deviations from the PPP rate.

More recently, several versions of a simple econometric model,
originally developed by Hodgson (1971) (1972), have been used by
various authors[28] to examine exchange rate fluctuations in the
inter-war years. Its performance is especially relevant because
the model used in the present study is basically an extended version
of Hodgson's model. It hypothesises that exchange rate fluctuations
are determined chiefly by "economic fundamentals", the most important
of these being relative price levels (thereby incorporating the PPP
doctrine). Other "fundamentals" of importance are relative income
levels, relative money supplies (a cash balance effect), interest
rate differentials and seasonal factors.

The simplest version of the basic model is given by Thomas
(1973a): .

$$ER = f \ (P_A, \ P_B, \ i_A, \ i_B, \ Y_A, \ Y_B) \qquad (3.1)$$

where ER = price of one unit of B currency in terms of A
currency

P_A = price level index in A

P_B = price level index in B

i_A = "the" interest rate in A

i_B = "the" interest rate in B

Y_A = the level of real income in A

Y_B = the level of real income in B

He then estimates this in ratio form to reduce multicollinearity and to increase degrees of freedom:

$$ER = b_0 + b_1 \ P_r + b_2 \ i_r + b_3 \ Y_r + e \qquad\qquad (3.2)$$

where $P_r = P_B/P_A$, etc.

Finally, in the presence of serial correlation, he introduces seasonal dummies and a time trend into his final estimating equation which he then estimates for the exchange rates of six countries (Canada, France, Britain, Spain, Sweden and the Netherlands) against the U.S. dollar. In all six cases the relative price variable carried the correct sign (negative) and was highly significant; moreover one or more of the other variables were also significant thereby suggesting that exchange rates were indeed determined by "economic fundamentals" (especially relative prices) in this period.

Hodgson, himself (1971) (1972), came to much the same conclusion in his comprehensive analysis of the sterling-dollar exchange in the early 1920's. Only three detailed case studies of the 1930's experience have come to light: those by Ozmun (1976) on the pound-franc exchange, Hudgins (1973) on the pound-dollar exchange and Ridpath (1975) on the

Canadian dollar - U.S. dollar and Canadian dollar - pound exchanges.
A priori one would expect some difficulty in applying this model to
the 1930's partly because there was a greater tendency to "manage"
the exchanges in this period but mainly because the existence of
tariffs, quotas and other trade controls would tend to render the
PPP hypothesis inapplicable.[29] However, despite the fact that
official intervention (especially British) was found to have played an
important role, Hudgins, Ridpath and Ozmun all concluded that "economic
fundamentals" were still the major underlying determinants of the
exchange rate. In particular, relative prices were very important
which lends more support to the PPP hypothesis, and relative income
levels were significant although relative money supplies and interest
rate differentials did not show up very well.

A much shorter study of the 1930's by Whitaker and Hudgins (1976)
also exists. This is basically a modified and extended version of the
part of the earlier work by Hudgins dealing with the role of the British
EEA which was found to have had a small but significant influence on
the pound-dollar exchange. Nevertheless it also concludes that "much...
of the variation in the £-$ rate can be accounted for by broad changes
in economic conditions and policies bearing on foreign exchange
markets"[30] However, it is worth noting that although relative
incomes and (marginally) interest rates influenced the exchange rate,
relative prices were found to be insignificant.

Finally, some exponents of the monetary approach to the exchange
rate have also used the early 1920's as a testing ground, although the
number of studies is small and they are mainly concerned with providing
support for their theory rather than examining the question of exchange
rate stability. Clement and Frenkel (1980) looked at the pound-dollar

exchange rate in the 1921-25 period and Frenkel (1976) examined the
German exchange rate during the 1923 hyperinflation. Both studies
found some support for the monetary approach and so, to some extent,
can be interpreted as suggesting that exchange rates were determined
by "economic fundamentals".

Thus there is quite a lot of evidence to support the use of an
extended PPP hypothesis as an appropriate framework for examining
exchange rates in the inter-war period. Moreover, in a paper testing
distributed lag variants of the hypothesis for fourteen currencies
against the American dollar in the early 1920's, Hodgson and Phelps
(1975) found that, in eleven cases, over ninety per cent of the monthly
variation in exchange rates was explained by lagged price level move-
ments. Although they made no attempt to disentangle the effects of
speculation from those of ordinary trade-induced adjustments of
exchange rates to price level movements they are implicitly suggesting
that speculation was probably stabilising (and speeded up the adjust-
ment process). However, many people would dispute this contention
that foreign exchange speculation was mainly stabilising in the
inter-war period; indeed, the argument that the adoption of flexible
exchange rates would generally lead to great instability due to de-
stabilising speculation is one of the main pillars of the case against
flexible rates.

There are a variety of definitional and measurement problems
involved in dealing with speculation in the foreign exchanges and
these are discussed at length in chapter four. In the present section,
the main concerns are the results and conclusions of the studies of
speculation. Perhaps the most extensive of these is provided by
Aliber (1962) who looks at five exchange rates in the early 1920's:

the pound, the French franc, the Belgian franc, the Dutch guilder
and the Swiss franc (against the U.S. dollar, the   U.S. dollar,
the French franc, the pound and the U.S. dollar, respectively). His
conclusions are rather gloomy, the principal one being that specu-
lation was incapable of keeping fluctuations small in the early 1920's;
speculators as a group (especially in the forward market) showed little
flexibility and hence did little to dampen exchange rate movements
caused by political crises and temporary economic dislocations. He
bases his observations on speculation on an examination of changes
in the differential between spot and forward exchange rates (which is
a proxy for changes in speculative expectations and hence speculation
itself) and he backs these up by evidence derived from comparing
actual exchange rates to PPP rates.

He quotes the French cases as a very good example of destabilising
speculation eventually providing its own justification, and the Belgian
experience as "an interesting example of the difficulty of maintaining
economic independence in a system of flexible exchange rates",[31]
the implication being that it was a bad experience since the Belgian
franc was dragged along in the wake of the French franc because of
the close relationship between the two economies and the strong expec-
tations that the two currencies should, and eventually would, exchange
on a one-to-one basis. Moreover, although both the Netherlands and
Switzerland avoided the circle of (unstable) depreciating currencies
and rising prices and eventually returned to their pre-war parities,
their economies were very similar to those of France and Belgium in
some ways and, had it not been for extensive intervention in the
exchange market by the authorities and (more important) strong
expectations of a return to the pre-war parity with sterling on the

part of the speculators, they would probably have succumbed to
cumulative destabilising speculation in much the same way as the
French and Belgian francs. Nor was the pound free from speculation;
though most speculative pressure was upward and could not be described
as destabilising, it could not be said to be stabilising either, and
in fact ultimately led to the pound returning to the gold standard
at too high a level.

Aliber's conclusions were the most strongly critical of flexible
exchange rate systems of all the empirical work surveyed. While there is
fairly general agreement   that the French franc suffered from de-
stabilising speculation in the early 1920's (see below), nowhere
(other than in Nurkse (1944), of course) is general condemnation of
flexible rates and the implication that destabilising speculation
either occurred or nearly occurred in most cases expressed except in
Aliber's work. Not surprisingly he has been strongly criticised,
notably by Pippenger (1973) on two counts: firstly, Pippenger argues
that his choice of price indices[32] and method of calculating changes
in price levels and exchange rates is such as to exaggerate fluctuations
and hence the degree of instability; secondly, Aliber implicitly assumes
that the only reason for a discount or a premium in the forward market
(adjusted for interest rate differentials) is speculation; Pippenger
disagrees and argues that various other factors may cause this.[33]
Several other criticisms also come to mind: Aliber does not use
rigorous econometric methods like Hodgson and others; also he uses
deviations from the PPP rate as back up evidence ignoring the fact
that such deviations may be caused by non-speculative variables such
as changes in relative income levels. Finally, Aliber only really
provides evidence of destabilising speculation in the case of France

and Belgium (which is arguably a special case because of the close
relationship between the French and Belgian francs and the expecta-
tion that they should exchange on a one-to-one basis); consequently,
his ensuing generalisations are based more on hypothesis than fact.

Thomas (1973a) (1973b) also considers the possibility of de-
stabilising speculation in the early 1920's. He conducts two tests
for the currencies of twelve countries[34] against the U.S. dollar
from January 1920 to June 1924. He defines destabilising speculation
as occurring if speculators cause the magnitude of exchange rate
fluctuations to exceed that which would exist in the absence of
speculation. His first test assumes that deviations of the actual
exchange rate from the PPP rate were caused by speculation. Thus if
speculation causes the exchange rate to change by more than is indicated
by changes in relative prices then it is destabilising in the sense
defined above. It would therefore be possible to test equation (3.3)
to see if β_1 is greater than unity.

$$\text{Log ER} = \alpha_1 + \beta_1 \ \text{Log P}_r + \varepsilon_1 \quad\quad\quad (3.3)$$

(where the variables are as defined above)

However, this test is open to criticism as it ignores the effect of
other non-speculative variables and may therefore bias β_1 downwards
and so equation (3.4) is estimated to see if β_2 is above unity.

$$\text{Log ER} = \alpha_2 + \beta_2 \ \text{Log P}_r + \beta_3 \ \text{Log i}_r + \beta_4 \ \text{Log Y}_r + \varepsilon_2 \quad (3.4)$$

Only the French franc-dollar exchange rate provided a β_1 or β_2 above
unity.

The second test involves the use of an adaptive expectations model.

Given the importance of relative price levels, a plausible equation
showing exchange rate determination is given below:

$$ER_t = \alpha_1 P_t + \alpha_2 P_t^E \qquad (3.5)$$

where P_t = the current ratio of price indices of the two
countries

P_t^E = speculators' current notion of the "expected" or
"normal" price ratio

Suppose that P_t^E is revised during each time period on the basis of
the deviation between the currently observed price ratio and that which
had been expected in the previous period:

$$P_t^E - P_{t-1}^E = \beta (P_t - P_{t-1}^E) \qquad (3.6)$$

The greater the value of β, the more sensitive is the expectations
adjustment process; thus if β is substantially greater than zero then
an exogeneous increase in the price ratio induces a large upward
revision of the "expected" price ratio (and hence increases speculation).
He therefore derives a method of estimating the value of β and finds
only two countries (France and Italy) where β is substantially greater
than zero and as both of these experienced high, sustained inflation
in the period in question this is arguably not surprising.

Tsiang (1959) simply looks at deviations of the actual exchange
rate from the PPP rate for the pound (1919-25), the Norwegian kroner
(1919-26) and the French franc (1919-26), all against the dollar. In
the case of the pound he finds the two rates move very closely together
from 1922 onwards; in the period 1919-21 he finds three sharp twists
in the actual rate only one of which attributes to speculation. These
three sharp movements also occur in the Norwegian and (more severely)

in the French rates and he attributes them to similar factors.
From 1922 onwards, however, in both the latter cases, the actual
rate tends to deviate progressively more from the PPP thus indicating
(on the assumption that all such deviations are due to speculation)
the presence of destabilising speculation. In Norway this progressive
deviation was arrested by a vigorous tight money policy but in France
an extremely elastic money supply with rigid interest rates allowed
it to continue. Thus Tsiang puts the blame for the French situation
from 1924 to 1926 on government policy (and also political instability)
and argues that there would have been difficulties even under fixed
exchange rates.

Stolper (1948), as reported above, has argued that deviations of
the actual exchange rate of the pound in the early 1920's from its
PPP rate were due not to speculation but to differences in relative
income levels. In fact, he is quite explicit about the (lack of a)
role for speculation:

> "As far as speculative movements of funds are concerned it
> must be stated categorically that except for one period
> in 1924 they cannot be considered to have played a major
> part in the determination of the actual rate". (35)

Grissa (1967), in an extensive study of speculation in the early
1920's, comes to a similar conclusion:

> "The experience of the franc and pound, therefore, rather
> support Friedman's hypothesis that given the stability of
> the underlying economic conditions, flexible exchange rates
> would tend to be stable". (36)

His basic conclusions are that the pound was "stable" (and not subject
to destabilising speculation) from 1921 to 1925 and the franc was
"stable" from 1921 to 1924 but not from 1924 to 1926; however, this

instability was due to government policy rather than speculation.

It would seem that there is now substantial evidence to suggest that, at least in the 1924-26 period, the French franc was subject to destabilising speculation. However, the argument that destabilising speculation affected any other countries in the inter-war years receives virtually no support at all, and furthermore, whether or not the case of the French franc is in any way indicative of the general pattern that might be expected when exchange rates are floating is highly contentious. It seems that it was largely the expansive monetary policy of the French government which caused the problems rather than any inherent tendency for destabilising speculation to occur during periods of floating exchange rates (the apparent lack of destabilising speculation in other currencies also supports this hypothesis) and at least one author, (Tsiang, 1959), is of the opinion that similar difficulties would have occurred even if the French exchange rate had been fixed.

An interesting final comment on the French franc in the early 1920's is provided by Eichengreen (1980), who uses a modified monetary approach to explicitly examine the assertion that the franc was subject to destabilising speculation. He generates a counterfactual exchange rate, based on non-speculative determinants of the franc-pound exchange rate, and compares it to the actual rate. He found that speculation could be considered both stabilising and destabilising: stabilising, in the sense that over the entire period speculation decreased the variance of the exchange rate, but destabilising, in that speculation may have increased the variability of the exchange rate around its trend.

Finally, in the same (monetary) vein, it is worth quoting the views of an exponent of the monetarist approach to exchange rate determination, which are contained in an article which examines past periods of floating exchange rates (in much the same way as this chapter has attempted to do):

"Furthermore, our own data and the opinion of most other economists writing about these periods, with the exception of Nurkse (1944), seem to agree about the conclusion that there is very little evidence of inherent instability and destabilising speculation, except for Germany under hyper-inflation and possibly Russia in the nineteenth century and France in the 1920's. In the latter two cases available information indicates that a lack of control of the money supply was probably the main reason behind this". (37)

The brief survey of the importance of destabilising speculation in periods of floating exchange rates contained in the present chapter would suggest a similar conclusion.

(IV)

There is a great problem of interpretation in looking at past periods of floating exchange rates with a view to using this evidence as a basis for theorising about particular sub-periods. In particular, different conditions may render any particular episode inappropriate as a basis for examining another and it may well be that every experience should be treated as being unique. Nevertheless, it is clear that, in spite of the differences between particular "floats", much of the evidence, and indeed most of the econometric evidence, suggests that floating rates were normally not subject to destabilising speculation but were generally "stable" in the sense of being determined by "economic fundamentals". In fact, in the inter-war years, the only alleged occurrence of destabilising speculation whose existence

would receive widespread support, is the experience of the French franc from 1924 to 1926, and even then most authors would be inclined to blame the instability of the franc on government monetary policy, rather than any inherent tendency towards destabilising speculation.

This conclusion and the theoretical survey (presented in chapter two above) would suggest that it is not unreasonable to hypothesise that exchange rates are determined by "economic fundamentals", most especially relative prices but also relative incomes and interest rate differentials. The most under-researched period (and the one therefore most subject to assertion rather than conclusions based on empirical evidence) is the 1930's. Consequently, the following section (Chs. 4-8) attempts to develop and test a model of exchange rate determination based primarily on the assumption that exchange rates were largely determined by "economic fundamentals", even in the 1930's, arguably the most turbulent period of floating exchange rates with the exception of the 1970's.

FOOTNOTES TO CHAPTER 3.

1. Yeager (1969) p. 89.

2. Ibid, p. 67.

3. A depreciation of the guilden led to cheaper Austrian securities which attracted a demand for them and hence for guilden with which to buy them, thereby offsetting the original depreciation.

4. Yeager (1969) p. 85 .

5. Ibid, pp. 86-7.

6. Friedman and Schwartz (1963) p. 76.

7. Wimmer (1975) p. 105.

8. Ibid, p. 120.

9. Ibid.

10. See Yeager (1976) p. 551 n.19 for a list of references.

11. Rhomberg (1964) p. 449.

12. See Yeager (1976) p. 548, Poole (1967) pp. 214-5, Arndt (1968) p. 62.

13. Rhomberg (1960) p. 448, Mellish and Hawkins (1968) p. 64, Arndt (1967) p. 67.

14. Yeager (1976) p. 546. See also Mellish and Hawkins (1968) pp. 5-27 for a detailed examination of the role of official intervention.

15. Yeager (1976) p. 559. An expression of this opinion and a useful discussion of the Canadian float can be found in Friedman and Roosa (1967) pp. 122-6.

16. Tsiang (1959) p. 271.

17. Tsiang (1957) p. 449.

18. Ibid, p. 466.

19. Hirsch and Higham (1974).

20. Yeager (1976) p. 605.

21. Ibid, p. 600.

22. Lloyds Bank Economic Bulletin No. 20, August, 1980.

23. See Genberg (1978) and Thygesen (1978).

24. Frenkel (1976) p. 208. The other main building block is the standard monetarist assumption that money supplies determine prices.

25. This is the relationship tested for the 1972-75 period in
Ch. 6 of Frenkel and Johnson (1978).

26. Nurkse's study is criticised in detail in Ch. 1.

27. The wholesale price index of all goods, the wholesale price index
of raw materials only and a cost of living index. Most of the
studies discussed in this section used wholesale price indices
(of all goods). The appropriate choice of price index has been
discussed in detail in Ch. 2.

28. See Hodgson (1971) (1972), Hudgins (1973), Ozmun (1976), Ridpath
(1975), Thomas (1973a) (1973b) and Whitaker and Hudgins (1976).

29. This problem is discussed in chapters 2 and 4.

30. Whitaker and Hudgins (1976) p. 1483.

31. Aliber (1962) p. 229.

32. Pippenger (1973) pp. 613-4. Aliber's use of a retail price index
in the French cases is especially criticised on the grounds that
this particular index is a poor one.

33. Ibid, pp. 616-8. Furthermore, it may be argued that Aliber employs
a very advantageous double standard: on the one hand, he dismisses
the use of deviations from the PPP parity as his main measure of
speculation because they may understate speculation (Aliber 1962,
p. 179) but on the other hand, he omits to tell us that the method
he uses to measure speculation may overstate it. (This is Pippenger's
point).

34. France, England, Belgium, Denmark, Netherlands, Norway, Sweden,
Spain, Italy, Switzerland, Canada, Japan.

35. Stolper (1948) p. 244.

36. Grissa (1967) p. 256.

37. Myhrman (1976) p. 193.

SECTION II: BILATERAL EXCHANGE RATES

CHAPTER 4

A MODEL OF EXCHANGE RATE

DETERMINATION

(I)

The starting point of the model to be developed below is the
PPP hypothesis which, in its least dogmatic form, states that relative
prices are the major determinant of exchange rates. This is normally
postulated as a long run theory and, as such, it is fairly widely
accepted in some general sense. However, the role of prices in short
run exchange rate determination is less widely acknowledged and requires
some discussion. In the first place, to the extent that the short run
exchange rate is a function of the long run exchange rate[1] an in-
direct role for prices in the determination of the former clearly
exists. A related point is that if the relationship between prices
and exchange rates is primarily a long run one then the latter can
presumably be taken to be a function of lagged values of the former,
one of which (in a monthly model) is that of the previous month and
so even according to a long run version of the PPP hypothesis relative
prices in the immediate past would have some role to play in the
determination of the current exchange rate.

In any case, an eclectic view of exchange rate determination
allows recourse to other theoretical frameworks which may suggest a
short lag on prices is most appropriate. A balance of payments
approach (which is further developed below) would indicate a very
short lag on prices as, in buying and selling, people are reacting
to current or very recent price levels.[2] A wide version of the

asset market approach may also suggest a short lag on prices as people adjust their portfolios in accordance with a number of variables including (presumably) all current (or very recent) prices. A final, possible, theoretical reason for a short lag on prices relates to the role of stabilising speculation. If the traditional long run PPP relationship between prices and exchange rates is recognised then any change in current prices (probably after a small lag) will have an immediate impact on exchange rates as (stabilising) speculators behave in such a way as to push the exchange rate towards its (new) long run PPP equilibrium.

Turning to the empirical evidence, the majority of the studies of the inter-war period (discussed in the previous chapters) found a strong relationship between exchange rates and either current prices or prices lagged one month.[3] This would strongly suggest the use of a similar lag in the present study. However, such evidence is rather negative in that it does not actually test for any lag structure. Fortunately more positive evidence is available: in the first place, some of the above studies do, in fact, try a variety of lags - for example, Hodgson (1971) tries lags of up to four months and eventually selects a one month lag on the grounds that it gives the best fit. Secondly there is one fairly extensive study (of fourteen exchange rates) of the early 1920's which explicitly tested the hypothesis that exchange rates were determined by lagged prices and came to the following conclusions:

> "The lag weights....suggest that the peak effect of price
> levels on exchange rates occurred within the initial month...
> for six countries, and in the first month following the
> initial disturbance for five countries, and in the second
> month following the initial disturbance in the case of one
> country". (4)

> "In all fourteen cases the major impact of price level
> movement occurred within the first three months". (5)

This clearly supports a very short lag on prices. That study
used a Koyck lag; in the course of the present study an Almon-
type lag was applied to the pound-dollar exchange rate in the 1930's
(not presented in the thesis but further discussed below) and, although
the results were not particularly good they also suggested that the
major impact of prices was in the first few months. Thus there is
sufficient theoretical and empirical foundation to merit the use of
a very short lag on the relative price variable.

The question now arises as to what variables should be used to
"extend" this PPP hypothesis. The preceding two chapters would
suggest a number of other "economic fundamentals" which might
plausibly be hypothesised to have had a role in exchange rate deter-
mination, on theoretical or empirical grounds (or more usually both).
These would include relative income levels, interest rate differentials
and probably some variable to reflect seasonal factors. In addition
official intervention in the foreign exchange market was found to be
important and must clearly be incorporated. Finally, the inclusion
of a trend variable would seem to be appropriate. However, this is
all very unsystematic and ad hoc, although in principle, would appear
to test the relatively simple hypothesis - that exchange rates were
largely determined by "economic fundamentals" - quite adequately.
Nevertheless, a much more satisfactory theoretical framework can be
provided by an alternative route, namely the balance of payments view
of exchange rate determination. A model explicitly along these lines
was developed and tested by Hodgson (1971) (1972) and used by Hudgins
(1973), Ozmun (1976), Ridpath (1975) and Thomas (1973a). It is this

model which underlies the one used here and it can be viewed as
incorporating the PPP hypothesis as one of its main arguments. The
main modification is that the present version explicitly allows for
third country effects and is therefore more complete.

<center>(II)</center>

The Hodgson model is couched in terms of supply and demand
for the currency in question (pounds). A two country model is used
(U.K. and U.S.A.) and three sources of currency transactions are
recognised corresponding to the current, capital and official transac-
tions accounts of the balance of payments. Thus the first source of
supply of and demand for pounds is derived from trade in goods and
services. The demand function is effectively a British export
function - foreigners demand pounds to buy British goods and services;
similarly the supply function is a British import function. The main
explanatory variables are therefore relative price and (real) income
levels; a trend variable is also included to reflect changes in tastes
and seasonal variables are added. Thus current account currency flows
are represented as follows:

$$D_£^T = f \ (P_{UK}, \ Y_{US}, \ T, \ Z) \tag{4.1}$$

$$S_£^T = f \ (P_{US}, \ Y_{UK}, \ T, \ Z) \tag{4.2}$$

where $D_£^T$ = demand for pounds

$S_£^T$ = supply of pounds

P = a price index

Y = real income

T = a trend variable

Z = seasonal variables

Subscripts "UK" and "US" indicate British and American variables respectively.

Currency transactions will also be generated by "trade" in assets and their second source is therefore capital flows. Interest rate differentials may be important here and Hodgson (1971), Hudgins (1973), Ridpath (1975) and Ozmun (1976) also postulate a cash balance effect: for example, a rise in the supply of cash balances in Britain (not matched by an increase in demand) will tend to increase the demand of British residents for foreign currency as they increase their holdings of alternative assets, including foreign assets, in an attempt to re-establish their portfolio balance. Hodgson (1971) also included variables to represent "fears of capital loss" and "prospects for capital gain" while Ozmun included a similar variable to represent "psychological forces", and this procedure will also be followed here. The two structural equations generated are thus:

$$D_£^K \;=\; f \;\; (i_{US} - i_{UK} \;,\; M_{US} \;,\; S) \tag{4.3}$$

$$S_£^K \;=\; f \;\; (i_{US} - i_{UK} \;,\; M_{UK} \;,\; S) \tag{4.4}$$

where i = the interest rate

M = the money supply

S = a variable reflecting "speculative" factors

Finally there is the government sector consisting mainly of official intervention in the foreign exchange market (by central banks or by exchange intervention funds):

$$D_£^G \;=\; f \;\; (I_{UK} \;,\; I_{US}) \tag{4.5}$$

$$S_£^G \;=\; f \;\; (I_{UK} \;,\; I_{US}) \tag{4.6}$$

where I = official intervention

Equating supply and demand to give equilibrium, introducing
the exchange rate (R) to convert variables from dollars to pounds
where necessary and solving for the exchange rate gives:

$$R = f(P_{UK}, P_{US}, Y_{UK}, Y_{US}, M_{UK}, M_{US}, i_{US} - i_{UK}, I_{UK}, I_{US}, T, Z, S) \quad (4.7)$$

Hodgson, Hudgins and Ozmun all go on to estimate linear approximations
of this function.

Before extending the model to include third country effects
three modifications to this two-country version would seem appropriate.
Firstly, and most important, the inclusion of a money supply variable
is rather questionable. It seems highly likely that the money supply
is correlated with price levels, income levels and possibly interest
rates also; consequently its inclusion will lead to multicollinearity.
Moreover, not only does a money supply variable create technical
difficulties, but the inclusion of both money supply and price
variables would be theoretically incongruous to some, particularly
those who espouse the monetary approach to exchange rate determination.
It is also interesting to note that whilst Hodgson and Hudgins both
include relative money supplies in their theses (1971) (1973), both
exclude it in the published versions of their work.[6] In view of
all this, it seems prudent to drop the money supply variables in
the present study.

A second modification relates to the role of invisibles in the
trade sector; this is important conceptually and in many cases (such
as Britain) empirically as well. The problem is that whilst it is
clear that the demand for goods is determined largely by prices and
levels of income it is not immediately obvious why this should be
true of the demand for services; therefore some discussion of the

demand for currency for the purpose of "buying" and "selling" invisibles seems appropriate. In fact there turns out to be no need for additional variables.

The three major components of invisible trade for the countries in the study were shipping receipts and payments, interest and dividends from overseas investment and to foreign owners of domestic investments and tourist receipts and payments. Although it is possible to put forward specific variables which determine the supply of and demand for invisibles - relative costs of shipping freight and so on - it is impossible to collect any suitable data and in any case unnecessary since all three types of invisible flow are likely to be correlated with income levels which are already included in the model: earnings from overseas investments can be divided into two main components - dividends from equity investments and incomes from fixed interest bonds - both of which are likely to rise during prosperity (and fall during recessions), the former because of high (low) profits, the latter because of disappearance (appearance) of defaults; shipping receipts are related to traffic carried which depends on the volume of trade which in turn depends on the level of prosperity (real income); the relationship between tourist receipts and expenditures with income levels is obvious. In fact, in the case of Britain, Chang (1951) found such a relationship between invisibles and income for the 1924-38 period (annual data) when he regressed the volume of shipping services, interest and "other" receipts on income.[7]

Thus, in the trade (or current account) sector of the model, supply of and demand for currency due to flows of invisibles can be viewed as largely determined by the income variables. A third (and

final) modification to the two country model involves the intro-
duction of a trend variable in the capital account (as well as the
current account) section. This is to reflect the possibility of
a gradual capital flight from Europe to America in particular,
due to increasing fears of war which may be important for European
currency-dollar exchange rates. In practice this requires no new
variable but simply introduces an alternative interpretation of the
trend variable (war scare). Another possible interpretation of the
trend variable which could be mentioned at this point, is that it may
proxy relative productivity growth which may have been greater in
some countries than others.

A major criticism of the simple model described above (even
incorporating the modifications) is that it excludes the effects of
third countries. In the context of the market for pounds demand will
emanate not only from America but also from other ("third") countries;
thus the pound-dollar exchange rate could be influenced, for example,
by the relative demand for pounds and dollars in France. Such
possibilities were excluded by Hodgson and others mainly on the grounds
of simplicity: in order to keep the number of explanatory variables
down to a reasonable level, weighted averages of prices and incomes
of third countries would have to be calculated which would "involve
an extensive research project in itself.../and so/...a second best
...procedure appears warranted".[8] While some solace may be drawn
from Stolper's contention that events on the continent had little
effect on the pound-dollar exchange rate in the 1920's,[9] there is
no justification for simply assuming this was also true of the 1930's;
indeed the presence of serial correlation in Hudgin's estimates of
the pound-dollar exchange rate in the 1930's could be interpreted

as indicating the existence of omitted variables, some of which could be third country variables.

Moreover, an easy way of avoiding the dilemma of too many countries would seem to be to use just a single country as a proxy for the rest of the world, and in a world currency market dominated, as it was between the wars, by three major currencies - the pound, franc and dollar - the choice of an appropriate, representative third country is not too difficult. Once this problem of obtaining satisfactory data is overcome, the case for explicitly including third country effects on the grounds of its conceptual importance becomes overwhelming. There are also good econometric reasons for this: if the included and omitted (third country) explanatory variables are correlated then the estimators of the constant term and the co-efficients on the included variables will be biased and inconsistent and, more importantly, if they are not (which should be the case if multicollinearity is to be avoided when they are included) then although the estimates will be unbiased, their variance will contain an upward bias possibly leading to rejection of significant variables.

With all this in mind an extended version of the model is presented below using the pound-dollar exchange rate as an example. The structural equations are very similar to those for the two-country version except that the money supply variables have been dropped and there are now two sources of demand for each currency and three markets: the pound, the dollar and the ROW's (rest of the world's) currency.

(I) Market for Pounds

$$£D^{US} = f (R, P_{UK}, P_{US}, Y_{US}, i_{US}-i_{UK}, I_{UK}, I_{US}, S, Z, T) \tag{4.8}$$

$$£D^{W} = f (ER, P_{UK}, P_{W}, Y_{W}, i_{W}-i_{UK}, I_{UK}, I_{W}, S, Z, T) \tag{4.9}$$

$$£S^{US} = f (R, P_{UK}, P_{US}, Y_{UK}, i_{US}-i_{UK}, I_{UK}, I_{US}, S, Z, T) \tag{4.10}$$

$$£S^{W} = f (ER, P_{UK}, P_{W}, Y_{UK}, i_{W}-i_{UK}, I_{UK}, I_{W}, S, Z, T) \tag{4.11}$$

$$£D^{US} + £D^{W} = £S^{US} + £S^{W} \tag{4.12}$$

(II) Market for Dollars

$$\$D^{UK} = f (R, P_{US}, P_{UK}, Y_{UK}, i_{US}-i_{UK}, I_{UK}, I_{US}, S, Z, T) \tag{4.13}$$

$$\$D^{W} = f (EER, P_{US}, P_{W}, Y_{W}, i_{W}-i_{US}, I_{US}, I_{W}, S,Z,T) \tag{4.14}$$

$$\$S^{UK} = f (R, P_{US}, P_{UK}, Y_{US}, i_{US}-i_{UK}, I_{UK}, I_{US}, S,Z,T) \tag{4.15}$$

$$\$S^{W} = f (EER, P_{US}, P_{W}, Y_{US}\ i_{W}-i_{US}, I_{US}, I_{W}, S,Z,T) \tag{4.16}$$

$$\$D^{UK} + \$D^{W} = \$S^{UK} + \$S^{W} \tag{4.17}$$

(III) Market for ROW's currency

$$WD^{UK} = f (ER, P_{US}, P_{W}, Y_{UK}, i_{W}-i_{UK}, I_{UK}, I_{W}, S,Z,T) \tag{4.18}$$

$$WD^{US} = f (EER, P_{US}, P_{W}, Y_{US}, i_{W}-i_{UK}, I_{US}, I_{W}, S, Z, T) \tag{4.19}$$

$$WS^{UK} = f (ER, P_{UK}, P_{W}, Y_{W}, i_{W}-i_{UK}, I_{UK}, I_{W}, S, Z, T) \tag{4.20}$$

$$WS^{US} = f (EER, P_{US}, P_{W}, Y_{W}\ i_{W}-i_{US}, I_{US}, I_{W}, S, Z, T) \tag{4.21}$$

$$WD^{UK} + WD^{US} = WS^{UK} + WS^{US} \tag{4.22}$$

where:

Endogenous variables

$£D^{US}$ = demand for pounds by USA

$£D^{W}$ = " " " by ROW

$\$D^{UK}$ = " " dollars by UK

$\$D^{W}$ = " " " by ROW

WD^{UK} = " " ROW'S currency by UK

WD^{US} = " " " " by USA

$£S^{US}$ = supply of pounds (by UK) to USA

$£S^{W}$ = " " " " " to ROW

$\$S^{US}$ = " " dollars (by USA) to UK

$\$S^{W}$ = " " " " " to ROW

WS^{UK} = " " ROW's currency (by ROW) to UK

WS^{US} = " " " " " " to US

R = pound-dollar exchange rate

ER = effective exchange rate of UK (against ROW)

EER = " " " of US " "

Exogenous variables

$P^{\bullet}$ = an index of prices

$Y^{\bullet}$ = an index of real income

$\underline{/i-i/}^{\bullet}$ = an interest rate differential

$I^{\bullet}$ = official exchange rate intervention

S = a variable reflecting "speculative" factors

Z = seasonal variables

T = a trend variable

$(P^{\bullet} = P_{UK}, P_{US}, P_{W}$, etc.)

Subscripts UK, US and W refer to British, American and ROW variables respectively.

Solving for R would give the partially reduced form:

$$R = f (P^*, Y^*, \underline{/i-i}\underline{/}^*, I^*, ER, EER, S, Z, T) \qquad (4.23)$$

The presence of endogenous, explanatory variables would make OLSQ
(ordinary least squares) estimators of this equation inconsistent
but fortunately, this is not true of the fully reduced form:

$$R = f (P^*, Y^*, \underline{/i-i}\underline{/}^*, I^*, S, Z, T) \qquad (4.24)$$

There is still an identification problem but this is not crucial as
it is not necessary to derive the structural coefficients (from the
reduced form coefficients) to test the hypotheses that represent the
focus of the study. Consequently the empirical chapters will con-
centrate on OLSQ estimates of equation (4.24).

A further question relates to whether or not equation (4.24)
should be assumed to be linear or log-linear. A priori, there is no
particular reason for preferring one to the other. In fact it may be
preferable to try both and let the data decide the most appropriate
form. Certainly, it would be interesting to use a log-linear form as
this would provide information about elasticities. This would be
especially useful in connection with relative prices, as the long
run PPP hypothesis would predict a price elasticity of unity and
presumably, therefore, the logarithm of relative prices in the model
developed here, would be expected to have a coefficient no greater
than unity. Indeed, the value of price elasticities of exchange
rates has been used by one author as a test for destabilising spec-
ulation in that a coefficient greater than unity could be interpreted
as implying that the exchange rate was "overshooting".[10] Unfortunately
the fact that some of the variables take negative values precludes

any log-linear form from being tested (since the logarithm of a
negative quantity is not defined).

One final modification to equation (4.24) is required. This
involves converting it to ratio form for two reasons: firstly, and
least important, to increase the degrees of freedom, and secondly,
to shift this BOP view of exchange rates closer towards a relative
PPP hypothesis. Thus, the study will provide OLSQ estimates of a
linear approximation of equation (4.24) in ratio form, that is, for
the pound-dollar exchange rate:

$$R = \alpha_0 + \beta_1 (P_{US}/P_{UK}) + \beta_2 P_W + \beta_3 (Y_{US}/Y_{UK})$$
$$+ \beta_4 Y_W + \beta_5 (i_{US}-i_{UK}) + \beta_6 (i_W-i_{UK})$$
$$+ \beta_7 (i_W-i_{US}) + \beta_8 I_{UK} + \beta_9 I_{US} + \beta_{10} I_W$$
$$+ \beta_{11} S + \beta_{12} Z + \beta_{13} T + \epsilon \qquad (4.25)$$

At this point in an attempt to stress the eclectic nature of
this balance of payments/extended PPP model, it is interesting to note
its similarities (and differences) with the monetary approach, especially
as adopting the latter was explicitly rejected in chapter two. A
typical monetary model is to be found in Frenkel (1980):

$$R = f (M, M^*, Y, Y^*, \pi) \qquad (4.26)$$

where R = the exchange rate

M = domestic money supply

M* = foreign money supply

Y = domestic real income

Y* = foreign real income

π = a variable to proxy expectations

Substituting prices for money supplies (especially cost of living indices),[11] which in an empirical sense would presumably not be entirely unobjectionable to monetarists, produces an equation not too dissimilar to (4.25), especially as a speculative/expectations variable is not only included in the latter but in some regressions is actually based on the forward exchange rate which is the indicator of expectations favoured by Frenkel.[12] Furthermore, a more general asset approach would presumably also incorporate interest rates in some form creating even greater similarities.

However, there are important differences, most notably a monetary model would suggest the opposite sign for the real income variables[13] and also, in certain circumstances, for the interest rate variables;[14] in fact, this observation may be useful, to the extent that it may indicate that "wrongly signed" incomes and interest rates should be interpreted not as a failure of "economic fundamentals" to show up "correctly" in the regressions but rather as supporting a monetary view of exchange rate determination (which still precludes Nurkse's hypothesis of unstable exchange rates in the 1930's). In any case, the very fact that a number of the independent variables in equation (4.25) would also be included in a monetary model (albeit with different expected signs) would further support the use of the model developed here as a simple test of the Nurkse hypothesis (which is primarily what is intended).

A final area of interest in specifying the actual structure of the model is the length of lags. This has already been discussed in connection with relative prices above (Section I) and it is not proposed to engage in an extended discussion here. Clearly several variables should be unlagged: official intervention is obviously on

a day to day (or even hour to hour) basis and therefore the inter-
vention dummies should not carry a lag.

In addition a short lag on most of the other variables seems
appropriate both on theoretical grounds:

> "It is generally accepted that in the short run dis-
> turbances in income levels, capital flows and seasonal
> factors have a significant effect on exchange rates". (15)

and empirical grounds: Hodgson (1971), Hudgins (1973) and Ozmun (1976)
all experiment to some extent and all conclude that short (one month)
lags give the best results "in terms of producing the lowest error-
variance in the fit".[16] Hudgins also tried a Koyck lag but dis-
continued it because "the estimated coefficient of the lagged exchange
rate implied either an unstable adjustment mechanism or one implying
an implausibly long lag in adjusting the exchange rate to the other
variables."[17]

Relating specifically to prices, further reference can be made
to the experiments involving the fitting of Almon lags[18] to estimates
of the pound-dollar exchange rate in the 1930's (undertaken in the
present study). The drawbacks and limitations of this approach are
well known[19] but, in the present context, a more important point
is that the results of the Almon lag experiments suggested that a
short lag on prices was more appropriate anyway. Furthermore, intro-
ducing additional lagged price terms did not significantly improve
the performance of the model (in terms of increasing the value of
the coefficient of determination). Finally, whether a detailed
specification of the lag structure is necessary (especially in view
of the evidence indicating the primary importance of short run effects)
in order to test the relatively simple hypothesis presented here -

basically whether or not exchange rates were determined, to any
significant extent, by "economic fundamentals" - is dubious. Con-
sequently, it was decided to use a one period (month) lag for the
price and income variables and current values of all the other
variables.

Having described the model and decided on the form of estimation
and lag structure, something needs to be said about the expected signs
of the independent variables. In fact, this will vary according to
whether or not the exchange rate is expressed in foreign currency
per unit of domestic currency or vice versa. In other cases it will
depend on how the variable is constructed: for example, whether the
pound-dollar official intervention dummy is positive (negative) or
negative (positive) when the pound (dollar) is being supported will
determine its expected sign. Therefore, the expected signs of par-
ticular variables will be made clear where the empirical results are
presented, The only general point that can be made at this stage is
that the relative price and relative income variables will always be
constructed so as to have expected negative signs.

Finally, it should be observed that as far as estimation of
this model is concerned, there is one equation too many in the sense
that if, in a three currency model, two exchange rates are estimated
then the third, has also been implicitly estimated (via cross-rates);
the third set of estimates is therefore redundant. There are still,
however, a number of good reasons for estimating the third leg of
an exchange rate triangle. In the first place it would seem better
to directly test whether the model "works" for any given exchange
rate rather than rely on an indirect test using cross-rates. In
addition, such a test allows direct observation of the signs and size

of coefficients of the independent variables which determine the
third exchange rate; this is extremely useful as it avoids having
to attempt to work out these coefficients from the regressions of
the other two. It may be argued that "correct" signs of variables
in these other two regressions implies "correct" signs for the third
exchange rate but, not only may ambiguities arise when only some of
the variables were correctly signed but also, in some cases - par-
ticularly exchange fund dummies and speculative dummies - the actual
size of the coefficient is important. It would seem, therefore, that
if the hypotheses developed here are to be tested thoroughly then it
is desirable to estimate all exchange rates directly.

Another factor that would reinforce this conclusion even more,
is the possibility of disorderly cross-rates, which would imply that
the coefficients of the independent variables and the predicted
exchange rate derived indirectly through a cross-rate (based on re-
gressions of the other two exchange rates) would be different to those
derived from a direct regression of the third exchange rate (since
the dependent variables - the implied cross-rate and the direct rate -
would be different).[20] This would create problems of interpretation
because, although the predicted cross-rate can be adjusted by examining
the difference between the actual direct and actual cross-rates, it is
difficult to envisage how a similar adjustment could be applied to the
size and signs of coefficients. This would not matter if the sole
intention were to test the hypothesis that the model presented here
largely explained exchange rate movements in the 1930's but it is
not; hypotheses concerning individual variables are to be examined
and reliance on estimates via cross-rates would create problems. It
might, however, be useful to compare predicted cross-rates with predicted

direct rates, at least for the major (pound-dollar-franc) exchange triangle. These should, especially after adjustment for differences between actual direct and actual cross-rates, be fairly similar and, if they are not, then this would suggest some inconsistency that required explanation.

(III)

The provision of empirical counterparts for the variables in the model involves a variety of difficulties. Most obviously, there are problems involved in the choice of the price indices to be used as a measure of PPP which have already been discussed in Chapter 2. A further constraint may now be added in the context of the 1930's relating to the actual availability of data. The theoretical possibilities are very much narrowed down because of this: clearly GNP deflators are excluded because they do not even exist on an annual basis for the 1930's in many cases and this also applies to cost indices. The most readily available type of price indices are of wholesale prices although they are arguably the least suitable. However, availability has made wholesale price indices the most popular choice[21] and for that reason alone, it seems prudent to estimate a version of the model using wholesale prices, if only for comparability with other studies. Fortunately, cost-of-living indices are available for all the countries to which the model is to be applied although these are possibly less reliable.[22] It has also been possible to find wage indices for the U.S.A. and U.K. and so a relative wage version of the model can be estimated for the pound-dollar exchange rate. To summarize, two versions of the model will be estimated, one using wholesale price indices, one using cost-of-living indices and for

the pound-dollar equation (only) a third version using relative
wages will be tried.

There are further problems involved in obtaining a variable
for real income since there is no data as such for most countries
or, if it does exist, it is not available on a monthly basis. Lack
of actual data does, in fact, solve one problem, in that the decision
as to which price index has to be used to deflate the income data
(since the required variable is real income) is avoided. However, it
creates another since a proxy has to be used and there are several
available.

The three major potential proxies are employment, unemployment
and production indices[23] which are all directly abservable, but an
alternative (indirect) approach is to use monetary data, and this is
explored first. It was done for New Zealand in the 1870-1918 period
by Hawke (1975) and the method is quite simple: obtain money supply
data, invoke Fisher's equation (MV = PT), adjust the money supply data
for changes in V and what is left is an approximation for national
income. However, in the present context, there are two problems:
firstly, potential multicollinearity between the money supply and
other variables, which has already been discussed above, and secondly,
obtaining reliable (or, in some cases, any) estimates of V. Consequently,
in the light of these difficulties, the limited number of countries to
which the method could be applied and the availability of alternative
proxies, this approach was not pursued.

This reduces the number of available proxies but a choice still
has to be made and there are at least four ways of approaching this:
the most simple is to use the same proxies as earlier studies;[24]

however, this is rather evasive and may simply involve repeating earlier mistakes. Three other avenues would seem rather more satisfactory: firstly, examine the annual national income data that is available and compare it to the annual values of the proxies to see which of them most closely approximates it; secondly compare the available proxies to see if they differ very much because it they do not then the choice is not an important one; finally, all the proxies could be tried and the data could "decide" in the sense that the proxy that gave the "best" results could be used.

All three avenues were explored to some extent. An index of Feinstein's annual estimates of British GNP[25] were compared to the annual values of the British income proxies. Although this is potentially misleading in that correlation on an annual basis does not necessarily imply correlation on a monthly basis, it was clear that the British employment based proxy most closely approximated Feinstein's GNP estimates, although all three indices had the same trend (upward) throughout the 1930's, and so the unemployment based proxy cannot be entirely dismissed. Indeed, a comparison of all the available indices for each country in the study (except Switzerland where only unemployment data was available on a monthly basis) showed that, broadly speaking, in all cases the indices exhibited the same trend and the main difference was that the employment and (especially) production based proxies tended to exhibit wider movements.

The "empirical" approach of experimenting with different proxies was adopted in some preliminary estimates of the pound-dollar exchange rate (with France proxying the rest of the world). In fact, there was little to choose between the performance of the different proxies (although this is not perhaps entirely surprising given the similarity

of trends). However, in the American case the employment index
gave slightly "better" results (in terms of higher t-statistics)
whilst the production index was marginally the "best" proxy for
French income. Ultimately, the problem can be avoided by trying all
possible combinations but this is rather open-ended and would involve
a large number of computations. To avoid this it was decided, on the
basis of the above evidence, to choose the income proxy in the following
order of precedence: employment indices, production indices and indices
based on unemployment data. However, alternatives will be tried on
occasion, especially when the chosen proxies are insignificant.

A third "economic fundamental" in the model - interest rate
differentials - involves a similar problem of choice to the income
proxies in that data for a number of interest rates are available.
The question is which of these is most important in determining inter-
national capital flows.[26] The choice would be easier for the 1920's
since (according to Einzig) before 1931 most funds engaged in interest
arbitrage were mainly invested in bills[27] thereby making the discount
rate differential an obvious choice. Unfortunately, after 1931, the
discount rate differential declined in importance in this respect
and a number of interest rates became influential in the 1930's. In
fact, there were several "interest parities" relating to different
types of interest rate and it would be desirable to take some sort
of weighted average. The whole issue is further complicated by the
existence (in some countries) of negotiable interest rates and by the
fact that the interest rate differential has to reach a certain size -
half a per cent according to Keynes[28] - before arbitrage becomes
profitable; hence strictly speaking, any differential less than $\pm \frac{1}{2}\%$
should be treated as zero. The difficulty in finding a representative

interest rate may account for the poor results obtained by Hudgins
(1973) and Ozmun (1976) in the only other comparable studies of the
1930's.

An alternative reason for this, which is arguably of some
importance, is that interest rate differentials may have had little
influence on international capital movements, given the low interest
rates of the 1930's and the political turbulence and uncertainty of
the period. It seems likely that the major concern of holders of
capital may have been safety. This is stressed by Drummond:

> "In such an environment, there was naturally more interest
> in protecting capital - in prospects for exchange rates and
> freedom to use and transfer funds - than in relative interest
> rates". (29)

For this reason, the speculative dummy variables (discussed below),
which (mainly) reflect possible sources of socio-political influence
on the confidence of holders of capital, are more likely to show up
in the estimates, since they seem more likely to have determined in-
ternational capital flows than interest rate differentials in the
period. Returning to the choice of interest rates, which now begins
to appear less important, the difficulties of producing a weighted
average (and impossibility of providing any rationale for choosing
the weights) suggested the continuation of the practice of earlier
studies and monthly averages of the discount rates for three months'
prime bills, which are readily available for all the countries in
the study (except Canada), were used.

The modelling of official intervention in the foreign exchange
market is difficult because such intervention had to be secret in
order to be effective and so there is no data. However, various
observers, who knew the market, were able to deduce when intervention

was taking place and this was reported in some contemporary
sources, though only in a subjective manner. The practice of
Hudgins (1973) and Ozmun (1976) was therefore followed and dummy
variables were constructed. This is clearly a highly subjective
exercise and the construction of these variables is discussed, at
length, in an appendix to this chapter along with the highly con-
troversial issue of competitive depreciation. Neverthless, one
possibility that needs to be discussed at this stage is that such
variables may be endogenous.

Essentially intervention depends on the deviation between
the actual exchange rate and what the exchange funds think it ought
to be (R^T). Tne endogeneity (or otherwise) of the intervention dummies
therefore depends on what determines R^T: if the funds really did follow
their official aim of not preventing genuine trends and simply smoothed
out "undue fluctuations" then R^T depended on the variables that determined
the exchange rate which are obviously included in the model and so the
intervention dummies would be endogenous; however, if intervention
(and hence R^T) were determined independently then it would be exogenous.
It has been claimed in many sources that the British authorities
deliberately held down the pound at various times in the 1930's, [30]
and the activities of other exchange funds also seem to suggest that
they   did   rather more than simply smooth out "undue fluctuations"
in this period. [31]   Consequently, it does not seem unreasonable to
assume that official intervention can be treated as being exogenous. [31A]

The performance of seasonal variables in the three previous
studies of the 1930's has shed some doubt on their importance: Hudgins
(1973) Ridpath (1975) and Ozmun (1976) all found that they did not show
up very well. Hudgins argues that the absence of seasonal patterns

would be expected "if arbitrage were working to exploit the profit-
making opportunities that such patterns would offer",[32] although
one might ask why this did not happen in the early 1920's since
Hodgson (1971) (1972), like Hudgins dealing with the pound-dollar
exchange rate, found that all his seasonal dummies were significant.
Perhaps a more likely possibility is that the EEA (Exchange Equilisation
Account) would smooth out seasonal (and therefore temporary) fluctua-
tions in the exchange rate (since this was its stated aim) although
such activities would be likely to show up in the official interven-
tion dummies.

In fact, there are good reasons for expecting some kind of
seasonal effect: in the pound-dollar exchange rate, the tendency for
the pound to weaken in autumn due to a demand for dollars to finance
purchases of American wheat, cotton, tobacco and other primary products,
and then to stengthen in the spring once this is over, is well-known
and these "usual" seasonal variations are referred to periodically
in contemporary sources.[33] However, there is some evidence that
such effects were weak in the mid-nineteen thirties (1934-36), due
to the decline of America as a wheat exporter and a build up of stocks
of primary products in Europe during the depression,[34] although there
is conflicting evidence on this with, for example, the "Economist"
suggesting why seasonal effects are less important and then using
them as an explanation of movements of the pound in the same month.[35]

On balance, it seems likely that there is sufficient evidence
of seasonal effects to make the inclusion of appropriate variables
necessary. Furthermore, this does not just apply to the pound-dollar
exchange rate since the demand for dollars to buy American primary
products in autumn came from Europe generally, not just Britain, and

applied not only to American dollars but also Canadian dollars
(given the importance of wheat in the Canadian economy). Finally,
a totally different reason for expecting seasonal fluctuations in
exchange rates relates to the importance of tourism for some countries;
this would affect some currencies (such as the Swiss franc) more than
others.

It remains to be decided exactly how seasonal effects are to
be incorporated into the model. The conventional method is to use
dummy variables and this should involve, in a monthly model, eleven
such variables. For some reason (possibly to increase degrees of
freedom) Hudgins (1973) Ridpath (1975) and Ozmun (1976) use quarterly
dummies to test for seasonal effects, even though they are testing
monthly models. This may account for the insignificance of their
variables — if one month is significant but the other two are not,
then the variable as a whole may not show up. Moreover how does
one choose which three months constitute a quarter?

Nevertheless, the practice of using eleven dummy variables
would waste degrees of freedom and, partly for this reason, a rather
unconventional method of measuring potential seasonal influences is
used here involving sine and cosine waves. This is based on the
assumption that seasonal patterns were fairly regular and, in the
first instance, values of six sine and six cosine waves were derived
each with a different frequency. Thus, one sine wave peaks (and
troughs) once in twelve months (A1), another twice (A2) and so on
up to six times (A6) and the same for cosine waves (B1...6). On
the basis of the expectation that the lower frequencies are most
likely to be significant (since one would not expect seasonal patterns
to peak more than two or three times per year) and a few preliminary

estimates which seemed to bear this out, it was decided, mindful

of degrees of freedom, to only include A1, 2, 3 and B1, 2, 3.[36]

The rest of the world variables to be included will be based

on a proxy country which involves a further choice. The need for

including such variables seems fairly obvious; the importance of

"foreign exchange triangles" (such as the pound-franc-dollar rela-

tionship) is stressed by Brown (1940).[37] The construction of weighted

averages of all the "world" variables would involve an extensive

exercise in itself and the reliability of the ensuing variables would

be constrained by the availability (and reliability) of data especially

for some of the more obscure countries. Such an exercise was there-

for eschewed (although a limited version of the world "price" variable

will be constructed for a related but different purpose in chapter

eleven).

In fact the choice of proxy country is not difficult. The

major "foreign exchange triangle" was obviously the pound-franc-dollar

triangle and so the proxy for the ROW for the pound-dollar, pound-franc

and franc-dollar exchange rates must obviously be France, America and

Britain respectively. Another triangle is formed by the Canadian

dollar, US dollar and pound; therefore for the Canadian dollar-pound

and the Canadian-US dollar exchange rates, America and Britain will

proxy the ROW. The choice for the minor gold bloc countries (Belgium,

Holland and Switzerland) is less easy since there are two suitable

proxies for each exchange rate against a major currency: for example,

for the belga-pound exchange rate either France or America would seem

possible. In fact, it is likely that the path of the belga (guilder,

and Swiss franc) against each of the major currencies, was largely

governed by the pound-dollar-franc triangle (and therefore the

movement of the underlying determinants of the exchange rates within this triangle), and so it may be appropriate to include both potential proxy countries.

It may seem that ROW variables (prices and incomes) should carry the same sign but in fact this is not the case because they influence the exchange rate in a number of different ways. For example, the effect of an increase in ROW prices on the pound-dollar exchange rate will be through three channels: US demand for pounds, UK demand for dollars and ROW demand for both pounds and dollars; or, put another way, Americans, Britons and consumers from the ROW will all switch from ROW goods to some combination of British and American goods. Changes in world income will have a less complex influence, presumably affecting only ROW demand patterns, although the relative effect on demand for British compared to American goods would be similarly unclear. This variety of avenues through which ROW prices and incomes affect a given exchange rate should, by itself, be sufficient to ensure that signs of the two variables may not be the same. However, once full allowance is made for differences in price and income elasticities, differences in tastes and the possible existence of money illusion, it becomes obvious that nothing whatsoever can be said about the expected signs of ROW variables and there is certainly no reason to believe that the signs of different ROW variables should be related in any particular way.

A final ("economic fundamental") variable included in the model is a linear trend. This is something of a residual variable in that it seeks to capture omitted influences. The usual rationale for its inclusion is that it reflects changes in tastes. However, it may indicate the presence of at least two other influences: firstly,

different rates of productivity growth and secondly, increasing
fears of war in Europe (and consequent capital flight). A problem
may arise with the trend variable in that it may be correlated with
other variables. Fortunately, this is minimized by the use of
variables in ratio form and by the existence of the 1937-38
recession (and the general unevenness of recovery) which means that
the price and income levels of the third countries proxying the ROW
did not exhibit a steady trend.

An important influence on trade flows in the 1930's (and hence
on demand for and supply of currencies and consequently on exchange
rates), which is excluded from the model, was the high degree of
protection practiced by many countries. This varied from country
to country with some (such as Belgium) less inclined to pursue it
than others. The likelihood that tariffs will undermine the PPP
relationship is well documented and even conceded by the proponents
of the PPP hypothesis (including Cassel); indeed, it has already been
discussed in chapter two. If the level of protection had remained
approximately the same throughout the 1930's as in the base year,
then this would be less of a problem but this is not the case.

At the empirical level it might be possible to proxy the level
of protection with the amount of customs revenue collected. Un-
fortunately, this method suffers from two major drawbacks: most
obviously, the lack of adequate data for some countries and, most
importantly, the conceptual criticism that this is only a partial
measure of protection, since it does not allow for quotas or exchange
controls. In the case of one country (Canada) there are fairly clear
turning points in its commercial policy and this enables the construc-
tion of (rather crude) dummy variables to approximate the effects of

protection on Canadian exchange rates. In all other cases, however, no variable to allow for protection is included.

Therefore one is forced to make two implicit assumptions which are, in the case of the pound-dollar exchange rate for example, as follows: firstly, net bi-lateral trade controls between the two countries in question (Britain and America) cancelled each other out; secondly, trade controls in the rest of the world, though having a large effect absolutely, had a negligible or equal effect on the markets for pounds and dollars (which implies that protection in third countries affected imports from Britain and America roughly equally). Whilst the former assumption is possibly not unreasonable, given that much protection was retaliatory and the removal of tariffs was largely based on bi-lateral agreements,[38] the latter is questionable for the same reasons (especially since the ROW is actually represented by an individual country).

(IV)

The final problem that remains to be dealt with is how to model speculation or, put another way, how to quantify the variable 'S' in the capital account section of the structural equations. Since stabilising speculation will tend to be picked up (to some extent) by the other variables, in that adjustment to changes in prices, incomes and other variables would be made more rapid by such speculation, this is mainly an exercise for testing for destabilising speculation. The quantification difficulties are discussed below but initially there is a problem of definition. Thomas has provided three definitions:

"Destabilising speculation..._/is_7_...a situation in which
speculators..._/1_7... cause the exchange rate to diverge
from some equilibrium rate over time..._/or (2)_7...influence
the behaviour of the equilibrium exchange rate..._/or (3)_7...
cause the amplitude of exchange rate movements to exceed
that which would exist in the absence of speculation". (39)

An identical trio are given by Aliber:

"...one is that speculators cause the range of movements in
the spot rate to be larger but without any impact on the
equilibrium rate; the second is that speculators cause the
actual rate to diverge from the equilibrium rate; and the
third is that speculators influence the path of the equilibrium
rate". (40)

Aliber's first and second (Thomas' third and first) definitions
are usually the definitions used in empirical tests. In fact, in periods
of floating exchange rates when the actual rate was free to change with
the equilibrium rate these two definitions would seem to amount to the
same thing: an excessive exchange rate movement is, presumably, one
which causes the floating exchange rate to diverge from its equil-
ibrium path. Aliber's third (Thomas' second) definition takes account
of the possibility that speculation-induced exchange rate movements
may influence internal price levels (for example) and therefore the
behaviour of the exchange rate; this approach is not explored here
as it would require a much more extensive model.

A wide variety of methods of testing for destabilising speculation
have been employed, all of which have drawbacks of one kind or another.
The basic problem stems from the fact that data on short term capital
flows is simply not available for many earlier periods or if it is,
it is not especially reliable as it is often based on an estimate
derived from residuals. Given this lack of data there are two
possibilities: the most obvious is to devise a proxy of some kind,
the less obvious (if disarmingly simple), is to ignore it, look at

deviations from the predicted exchange rate (on the basis of the variables chosen to determine the equilibrium rate) and attribute these to speculation.

The latter method has been explored by Stolper (1948), Tsiang (1959) and Hudgins (1973). It has the advantage of avoiding any criticism of the choice of variable to proxy destabilising speculation because no variable is used. Its major drawback is that it implicitly assumes that there are no omitted variables and that all the deviations are due to speculation. This may be a particularly dangerous inference to make in the present context as trade controls (with one exception) are not modelled and therefore must also be a prime candidate for the omitted variables which account for unexplained exchange rate movements. It also requires subjective judgement on how large deviations have to be in order to be considered. Studies which look at the difference between actual and PPP exchange rates are particularly prone to the accusation that the residuals are not necessarily due to destabilising speculation. The Tsiang (1959) and Stolper (1948) studies come into this category (although the latter does consider other possible reasons for the residuals). Hudgins' (1973) study is more acceptable in that he includes more variables to determine the equilibrium exchange rate but the problem remains.

Another approach that does not involve including specific variables for speculative activities might also be discussed at this point. This involves using a log-linear form and looking at the elasticity of exchange rates with respect to prices and, on the assumption that PPP implies that this should be equal to unity, if it is greater than unity then this implies "overshooting" due to destabilising speculation. This is the first approach of Thomas (1973b)

but the possibility of using it here is excluded by the existence
of variables with negative values which precludes the adoption of a
log-linear form.

Attempts to proxy speculation are usually based on forward
market data or some attempt to model speculators' expectations or
resort to dummy variables. Aliber's (1962) (1970) approach is to use
forward market data adjusted for changes in the money market interest
rate differential;[41] this assumes that the forward market is dom-
inated by speculators. If the forward rate is at a discount then
speculators are judged to be bearish, if at a premium then they are
bullish. If the adjusted forward discount (premium) is increasing
as the spot currency is depreciating (appreciating) then this provides
evidence of destabilising speculation. A related method is that of
Stein (1965) who regressed the forward premium on the uncovered
interest rate differential and then used the residuals as his
"speculative variable". This is basically a more sophisticated
version of Aliber's variable and, in the present context, seems un-
necessarily complex.

Another method of deriving a speculative variable is to base
it on some hypothesis about the behaviour of speculators. Assuming
that speculators base their behaviour on trends in the exchange rate,
recent changes in the exchange rate could be used in this context: if
speculators were operating in a stabilising manner they would view
any change in the exchange rate as temporary, expect it to return to
its previous level and react accordingly; if speculation were de-
stabilising then presumably any change in the exchange rate would be
amplified by their behaviour. This is the approach adopted by Mellish
and Hawkins (1968) in their study of the 1950's Canadian float. A

similar, though more complex, approach is adopted by Arndt (1968),
who assumes that speculative capital flows are a function of the
difference between the actual exchange rate and the "expected
normal rate" where the latter is determined by the deviation of the
actual current rate from the previous "normal rate". A variation on
this is the second method used by Thomas (1973b) who bases speculators'
behaviour not on divergences between actual and expected rates but
between actual and expected price levels (where prices determine
exchange rates).

The problem with either ignoring speculation and looking at res-
iduals or introducing a proxy for speculation of the kind discussed
above is that such methods involve "blanket" measures which could
potentially take in much more than just speculation. For this reason,
the method of Hodgson (1971) (1972) and Ozmun (1976) is, to some extent,
preferable. This involves attempting to identify events which are non-
quantifiable (or "non-economic" in the sense of not due to "economic
fundamentals") but may have influenced exchange rates, and then using
dummy variables to test for the presence of speculation (in the form
of short term capital flows) which may have occurred because of these
events. To the extent that such capital flows are "non-economic funda-
mental" they are destabilising, and significance of these dummy variables
can be taken as evidence of destabilising speculation. The main dis-
advantage of this approach is its subjectivity, both in deciding
which events merit the inclusion of dummy variables and in assigning
values to these dummies to reflect the intensity of influence of a
particular event (which may change during the period it is effective).
On the other hand, this method is not a "blanket" measure but, instead,
provides a test for the effect of specific events on the exchange rate,

if a somewhat unsatisfactory one.

The various methods of incorporating speculative factors
into the model, reviewed above, all have drawbacks of one kind or
another and consequently, it seems desirable to try several approaches.
Two broad types of approach have been identified: methods engaging
in a "blanket" measurement and those (in fact only one) seeking
to test for the effect of specific potential influences. It seems
reasonable to adopt one approach of each type. Of the latter type,
the dummy variable approach is the only candidate and will therefore
be used. In fact, this is really the favoured approach as relating
speculation to potential causes identified a priori is intuitively
appealing and seems more intellectually honest. In addition, it
encompasses the possibility that speculation may have been destabilising
some but not all of the time (which a "blanket" measure can not). The
ready availability of forward data (at least for the pound) would
suggest that the "blanket" measure should make use of this and the
simpler approach of Aliber (1962) (1970) is preferred to that of
Stein (1965).

An additional reason for preferring the dummy variable to the
"blanket" measure approach is that the "overshooting", implied by
the significance of the latter, only indicates that speculation was
destabilising insofar as speculators' expectations are incorrect (and,
of course, to the extent that such variables measure only speculation.)
This possibility is recognised by Aliber himself who describes this
view as follows:

> "...it is maintained that speculation should be considered
> stabilising in some cases in the inter-war years because
> speculators were only anticipating the weakness of the
> currencies resulting from non-speculative factors". (42)

This point is also taken up by Pippenger:

> "When inflationary conditions are changing rapidly, any
> tendency for the foreign exchange market to respond more
> quickly than the capital market to inflationary pressure
> will...generate an adjusted discount". (43)

Such speculation may be seen in terms of speculators simply being
correct in their expectations and causing the exchange rate to adjust
more quickly and possibly more often.

This problem does not apply to dummy variables to the extent
that they are constructed on the basis of potential influences which
should not rationally have caused any change in the exchange rate.
However, if, as was sometimes the case, speculators were quite right
to believe that a bout of political instability, for example, could
lead to a change in the exchange rate, then significance of a dummy
variable which reflects the consequent capital outflow is not really
indicative of destabilising speculation either. In fact, in the 1930's,
it may have been very often the case that speculators were correct and
so significance of any of the speculative variables included here
cannot properly be interpreted as evidence that the foreign exchanges
were bedevilled by destabilising speculation but only as evidence that
speculation occurred. Nevertheless, to the extent that they can be
constructed to reflect "irrational" influences on speculators' expec-
tations, dummy variables will provide the best test for destabilising
speculation.

However, in view of these ambiguities it may be instructive to
be more precise about the exact nature of the dummy variables used here.
They have been referred to as "non-economic" in the above discussion
which is, to a large extent, a misnomer in that the influences being

picked up are in some senses "economic". Most commonly, a "non-economic" dummy represents the economic actions stemming from expectations of the economic consequences of a political (and in that sense "non-economic") event, such as fears of inflation due to the election of a new government, or occasionally even an economic event, such as deliberate reflation by the government. Thus, more properly speaking, these dummies are not really "non-economic", or even "speculative", but they are rather "non-economic fundamental" and represent the economic consequences of people's expectations about the (economic) implications for exchange rates of various incidents, events and attitudes, economic or otherwise; clearly, such expectations need not necessarily be fulfilled for the actions of those who hold them to influence the exchange rate (and consequently for the dummy variables to be significant).

Nevertheless these dummies do reflect destabilising speculation to the extent that such expectations are "incorrect" or, perhaps better, imply a different level of the exchange rate to that believed to be the "correct" level by the government. Given that in many cases one or both of these situations (particularly the latter in the case of the gold bloc) is applicable, then the dummy variables used here will be picking up destabilising speculation and will, therefore, be called "speculative" dummies. At the same time though, it should be remembered that when "speculators" were "correct" or, more generally, when neither of these two conditions applies, and this is probably the case for at least some of the dummies, then the significance of a speculative dummy is not necessarily indicative of the presence of destabilising speculation.

Consequently, each case has to be examined individually and, in general, significance of the "speculative dummies" only implies, in the first instance, that exchange rates were being determined by influences other than "economic fundamentals". Therefore, to treat significance of these variables as indicative of destabilising speculation (and therefore supportive of the Nurkse hypothesis of unstable exchange rates in the 1930's) implies a rather severe test of the hypothesis (of stable exchange rates in the 1930's) being put forward in the present study.

Finally, in spite of the explicit inclusion of speculative variables, this does not preclude the implicit use of another method, discussed above, which is to examine the residuals: any deviations from the exchange rate predicted by the model could be due to speculation, although (as has been pointed out) it is dangerous to pursue this too far, as they could be caused by other omitted variables (such as the influence of trade controls). This completes the examination of the model and the derivation of empirical counterparts for the independent variables.

FOOTNOTES TO CHAPTER 4

1. See Officer (1976a) pp 2-3 (quoted in Ch. 2).

2. See Hodgson (1971) p. 29, Hudgins (1973) p. 83 and Ozmun (1976) pp. 63-4.

3. See, for example, Hodgson (1971) (1972), Hudgins (1973), Ozmun (1976), Ridpath (1975), Thomas (1973a) and Whitaker and Hudgins (1976).

4. Hodgson and Phelps (1975) p. 60.

5. Ibid, p. 63.

6. See Hodgson (1972) and Whitaker and Hudgins (1976).

7. Chang (1951) p. 122.

8. Hodgson (1971) p. 28.

9. For example, "the complete breakdown in international relations during the occupation of the Ruhr and the subsequent collapse of the mark left the pound rather unaffected". (Stolper, 1948, p. 251).

10. See Thomas (1973a) (1973b); this point is taken up again in the discussion of how to model speculation in Section IV below.

11. See Frenkel (1976) pp. 202-3 for an argument that the PPP hypothesis should be tested using cost-of-living indices.

12. See Frenkel (1980a).

13. The position adopted here is a traditional one: an increase in real income leads to an increase in demand for imports and therefore a depreciation. The monetary approach would argue that an increase in real income would lead to an increase in the demand for money which, unless it is met by an expansion in the domestic credit component of the money supply, will cause an appreciation. This argument is put forward by Mussa (1976) p. 237.

14. This possibility is explained by Frenkel (1976) pp. 208-10. Whilst accepting the traditional view (adopted here) that, in the short run, high interest rates attract foreign capital and hence cause the exchange rate to appreciate - the "liquidity effect" - he argues that there is also an "expectations effect" which, in certain circumstances (such as hyperinflation), dominates the "liquidity effect", thereby causing a rise in interest rates to be associated with a depreciation. The "expectations effect" operates in the following way: an increase in the expected rate of inflation causes a rise in the nominal interest rate whilst, at the same time, it lowers the demand for real balances and therefore a higher price level is required to restore asset market equilibrium (assuming money stock is unchanged). Given that PPP holds and that, during hyperinflation, the foreign price level can be treated as being fixed, the higher (domestic) price level can only be achieved through a depreciation. Hence a rise in the interest rate is associated with a depreciation.

15. Hodgson and Phelps (1975) p. 58.

16. Hudgins (1973) p. 83.

17. Ibid, p. 96.

18. The Almon technique involves the use of polynomials to approximate lag structures. There are two (essential) assumptions: firstly, the lag is of a finite length (n) and secondly, the lag structure follows a polynomial (of degree p - 1). See Almon (1965) for the original use of the technique.

19. Most obviously, since n and p are not known, some criteria has to be used to determine their values. See Thomas (1977) and Frost (1975) for a discussion of this and other problems.

20. In practice, small differences between cross-rates and direct rates inevitably occur as arbitrage would have to take into account transaction costs. In the present context it is larger differences which cannot be explained by transaction costs that are being discussed.

21. Hodgson (1971) (1972), Hodgson and Phelps (1975), Hudgins (1973), Ozmun (1976) Ridpath (1975), Stolper (1948), Thomas (1973a), Tsiang (1959) and Whitaker and Hudgins (1976) all use wholesale prices.

22. The French cost of living index is a case in point. For a discussion of the accuracy of French price indices see the Economist 6/8/32, pp 267-8.

23. Another possibility is to use indices of railway freight receipts. However, this would seem to be very much a last resort and, as at least one of the other three is available for all the countries covered here, it is not pursued.

24. Hodgson (1971) (1972), Hudgins (1973), Ridpath (1975) and Ozmun (1976) all favoured employment indices whilst Thomas (1973a), dealing with a larger number of countries with, in some cases, limited data, varied his choice using indices of industrial production (Canada) or of railway freight receipts (Spain).

25. This was calculated from C.H. Feinstein: "National Income, Expenditure and Output of the UK, 1855-1965" (Cambridge University Press, 1972) Table 5, p. T16.

26. The problems are comprehensively dealt with in Einzig (1937) pp. 157-168.

27. Ibid, p. 159.

28. Reported in ibid, p. 151. A number of later authors would put this figure much lower - no more than $\frac{1}{2}\%$ and probably even less. See Frenkel and Levitch (1975) p. 331.

29. Drummond (1979) p. 4. See also p. 3.

30. See Kindleberger (1973) p. 180, Pollard (1969) p. 230 and for a contemporary expression of this opinion see S. Harris:"Exchange Depreciation" (1936) p. 401 and Brown (1940) p. 1119. See also Howson (1980) for a general expression of this view.

31. See Drummond (1979) for a discussion of the management of the franc in the 1930's. However, it should be remembered that definite official views and objectives about exchange rate levels do not necessarily involve competitive depreciation.

31A. The problem is more acute for intervention in exchange rates which were "fixed on both sides", that is where both countries were on the gold standard. In such cases there is a clearly defined exchange rate target with intervention aimed solely at offsetting any deviation in the exchange rate from par, presumably caused by the other variables in the model, and therefore it must be endogenous. Fortunately, only three of the fourteen exchange rates in the study were fixed in this way for an appreciable part of the 1931-8 period and, in all three cases, the intervention dummies were insignificant anyway.

32. Hudgins (1973) p. 104.

33. See, for example, the Economist 24/9/32, p. 534, 14/10/33, p. 702, 21/8/34, p. 362, 22/10/38, p. 174 and so on.

34. See the Economist 31/8/35, p. 423 and the Statist 13/7/35, p. 42 for more details of this argument.

35. See the Economist 10/9/32, p. 452 and 24/9/32, p. 537 respectively.

36. Data for these variables are given in appendix I.

37. pp. 1060-65.

38. The Ottawa Agreements were based on this principle and from the mid-1930's onwards Cordell Hull, the US Secretary of State, negotiated a series of American bi-lateral agreements with other countries.

39. Thomas (1973b) p. 144.

40. Aliber (1970) p. 304 n. 2.

41. This is almost a monetarist approach since it is a common feature of monetarist models to use forward market data to proxy expectations. See, for example, Frenkel (1980).

42. Aliber (1962) pp. 172-3.

43. Pippenger (1973) p. 616. See also Friedman (1953) p. 176.

APPENDIX TO CHAPTER 4

OFFICIAL EXCHANGE RATE INTERVENTION

An important secondary aspect of the study relates to the role of official intervention in the foreign exchange markets in the 1930's. An attempt to model this is both necessary, as it was (according to many sources) a potentially (and sometimes actually) important influence on exchange rate movements in this period, and desirable because the 1930's mark the establishment of the major official intervention funds and their activities in these early years represent a source of some controversy. The first intervention fund was the British Exchange Equalisation Account (EEA) which began operations in 1932 and was soon followed by the establishment of American (1934) and Continental (1936) equivalents although intervention was undertaken by the Central Banks of all these countries in the period preceding the setting up of intervention funds, if on a more limited scale, and the intervention dummies constructed below do reflect such intervention (to the extent that evidence of its existence could be found).

It is not necessary here to engage in a detailed discussion of the mechanics and activities of these exchange funds (although these are briefly described further on): a good account of the British EEA is to be found in Howson (1980) and the American and French funds are described and compared to their British counterpart in Hudgins (1973) and Ozmun (1976) respectively. There were important differences between the three particularly in relation to sterilizing the effects of their dealings in foreign exchange on domestic credit conditions[1] and to some extent in their objectives also: the EEA (ostensibly at

least) had the objective of "checking undue fluctuations in the exchange rate"[2] whilst the US fund sought "to stabilise the dollar and to maintain its value as a currency"[3] which seems to have meant maintaining the official dollar price of gold at $35 (per fine oz.) and the French fund initially aimed to hold the franc within the new legal limits following the devaluation in September, 1936 although this was modified at the end of June, 1937 so that French intervention became discretionary with a similar objective to that of the EEA.

The most controversial aspect of exchange intervention in the 1930's relates to the question of competitive depreciation or more exactly the contention that the EEA deliberately prevented the pound from appreciating in order to improve Britain's trading position. This was a widely held view at the time particularly in America where, for example, one contemporary observer referred to "the persistent and successful efforts....to depress sterling relative to other currencies which were characteristic of the operation of the Exchange Equilisation Account in its first year..."[4] On the British side this was denied periodically, for example in the "Economist", which on one occasion provided some detail to "help to dispel the prevailing American belief that the British Exchange Equalisation Account was used to depress the pound against the dollar".[5] On the basis of empirical testing of their models Hudgins (1973, pp. 220-1) and Ozmun (1976, pp. 29-31, 157, 161) come to a similar conclusion.

In fact the contention that exchange funds did not engage in competitive depreciation is probably too naive and the truth of the matter seems to have been rather more complex particularly in the case of the allegedly worst culprit, the EEA. Basically, internal

British recovery (and consequently the cheap money policy) was given
precedence and there was to be no attempt to fix the exchange rate
of the pound - in fact throughout 1935 the Treasury deliberately
eschewed stabilisation largely for this reason though the desire
to avoid giving speculators a potential one way option was also given
some weight;[6] indeed Britain was the least enthusiastic participant
in the 1936 Tripartite Agreement. Nevertheless, this policy cannot
really be construed as deliberate competitive depreciation especially
as "to avoid antagonising Roosevelt"[7] was one of its aims. Con-
sequently, whilst the policy may have involved what were, on the face
of it, deliberate attempts to hold the pound down - in the mid-1930's
the EEA often intervened heavily whenever the pound threatened to rise
and in fact total reserves (not surprisingly) therefore doubled between
December 1933 and December 1936 - it is better interpreted not as
deliberate competitive depreciation but as giving priority to in-
ternal recovery and managing the exchange rate in such a way as to
facilitate this or, perhaps better, it is "incidental" competitive
depreciation.

Fortunately, for the purposes of this study, whether the funds
were working against each other or not does not really matter except
insofar as it makes it difficult to decide the sign to be given to
the dummy variable when competitive intervention was taking place.
However, even this is not a major problem as evidence of such
occurences is virtually non-existent; indeed a much more frequent
event is the existence of months in which a given fund operated in
different directions on different occasions. This apparent lack of
competitive intervention does not, nevertheless, really prove very
much in the context of the debate on its existence and importance

since during the period in which such activity was allegedly taking
place (the early 1930's) only the British fund was active. However,
as far as constructing a dummy variable is concerned there was no
conflict between exchange funds in this period (as only the British
were active) and so whether a fund was operating in a "competitive"
sense or not is irrelevant; what is relevant is its effectiveness
in influencing the course of the exchange rate.

The methods used for official intervention mainly consisted of
buying and selling domestic currency, gold and foreign currency in
the spot market. Recourse to the forward market was fairly rare,
at least in the British case, due to the views of Governor Norman
who "was almost obsessed by the fact that purely speculative transac-
tions are facilitated by the existence of forward markets. Accordingly
the Bank was still in the middle 1930's avoiding any regular inter-
vention in forward markets..."[8] although on two occasions in the
second half of the 1930's the EEA did engage heavily in forward
transactions (in late 1936 and again late 1938) and kept a small
amount of forward cover in francs in the 1934-36 period to offset
any potential exchange loss that would accompany a devaluation of
the franc. In addition other avenues of official influence on exchange
rates - government borrowing, controls on capital movements, interest
rate policy, budgetary policy and so on - were either ignored, used
for other purposes or ineffective in the British case, although used
to a greater degree in other countries. Thus it seems that concentrating
solely on intervention in the spot market (which is what is done here)
will lead to the construction of variables representing official inter-
vention which are complete in principle, if potentially (as will be
suggested below) incomplete in practice.

The actual construction of dummy variables to represent exchange fund activity is difficult and some discussion of the problems involved is necessary both to show how they were overcome and, to the extent that they were not, to illustrate the consequent limitations of the variables constructed. Contemporary sources of data do not exist due to the secrecy of official operations in the foreign exchange market and the data based on official sources that has become available recently, provided most extensively by Howson (1980), is incomplete for the last two years covered in this study (1937-38) and in any case only refers to the activities of the British fund. Therefore, the only remaining method of including official intervention would seem to be to follow the approaches of Hudgins (1973) and Ozmun (1976) and to construct dummy variables based on observations of exchange fund activity found in any available sources; such an approach becomes justified due to lack of alternatives.

Since the completion of these two studies two further sources of relevant information - Sayers (1976) and Howson (1980) - have been published and consequently the dummy variables constructed here are based on more information and are therefore potentially more reliable. The main sources were the "Economist", "Lloyds Bank Review", Howson (1980) and Sayers (1976); limited reference was also made to the "Statist" and indirectly (through reference to Hudgins' dummy variable which was partially based on this) the "Commercial and Financial Chronicle".[9] The major intervention dummies relate to the pound-dollar, pound-franc and franc-dollar exchange rates though they were also constructed for the exchange rates involving "minor" currencies.

There are a number of problems involved in using this rather subjective method of incorporating exchange fund activity into the

model, most obviously that created by incomplete "data": it cannot
be certain that all activity of the exchange funds is reported in
the sources used. In the case of the EEA it is not unreasonable
to assume that the information is fairly complete as Sayers and
Howson have had access to official sources but the data on American,
French and particularly Belgian, Dutch, Swiss and Canadian intervention
is almost certainly deficient. The more reliance that has to be placed
on contemporary sources such as the "Economist" and "Lloyds Bank Review"
the more likely is something to be missed. Since evidence of "minor"
currency intervention is almost totally dependent on such sources
then the results produced provide only a limited test of the effect
of official intervention on the exchange rates of these currencies
(or, put another way, only provide a test of the importance of some
of the intervention that actually took place) although to the extent
that intervention by Canada and the smaller gold bloc countries may
have been fairly limited, particularly before September 1936, this is
perhaps not too important a problem.

Another problem relates to the qualitative nature of the in-
formation that actually is available. The problems can be broken
down into two types: those relating to the period and those relating
to the strength of intervention. In the first case how should inter-
vention that occurs "for a while" be interpreted - is a "while" a
week or a month or even longer? In the second case words such as
"heavy", "extensively", "intermittently", "slight" and so on have to
be given a quantitative meaning. A related problem occurs when inter-
vention took place in both directions in the same month; a cancelling
out cannot necessarily be assumed if intervention was "heavy" in one
direction and "slight" in the other. A further aspect of this concerns

intervention in the same direction in two months when it was
"heavy" in one but "slight" in the other - does the observation
for the former month carry a higher value (which was the method
employed by Hudgins and Ozmun)? To a certain extent such problems
are more apparent than real since once the essentially subjective
nature of these variables is accepted then a certain amount of dis-
cretion and good judgement can effectively minimize most of these
difficulties. However, they inevitably remain and make the tests
for the effect of exchange intervention only partial although in the
wider context of the whole model this is less important since official
intervention is only one variable among many (although an important
subset of conclusions will relate to the effectiveness of this activity).

There is also the question of the "black and whiteness" of exchange
rate intervention in that the rationale underlying the construction of
these dummy variables implies that the authorities were simply either
supporting or depressing an exchange rate at any particular time.
Unfortunately, it was not always quite as simple as this and exchange
intervention was sometimes rather "grey" when, on occasion, the EEA
adopted a policy of holding the pound at a certain rate, then letting
it go when pressure built up to an uncomfortable degree, pegging at
the new lower or higher rate for a period, then letting it go again
and so on. The EEA did this in July, August and October 1932, July-
October 1933, August 1934 and again in June-September 1938[10] and
also the French did something rather similar in the August 1937-May
1938 period when the franc engaged in what might be termed a "controlled"
depreciation (which basically involved not letting the franc run away
with itself but letting it run nevertheless). This is intervention
in the "pure" sense of "smoothing out" a trend in the exchange rate

induced by market forces but in the present context might it not
appear that official intervention was unsuccessful since attempts
to hold the exchange rate were not working? The intervention dummy
would presumably then be insignificant or even "wrongly" signed.

This problem is partly an unavoidable consequence of using
time series analysis and arbitrarily cutting off each observation
at the end of the month when official intervention might have been
holding the exchange rate (and therefore "working") for a period
of less than a month but then the exchange rate might have been let go
in (for example) the last week. Of course, discretion and good judge-
ment can help here and specific examples of this behaviour can be
allowed for, although perhaps they ought not to be since, to the
extent that such activities held up a trend in the exchange rate
induced by market forces, official intervention may still appear to
be significant; holding a peg until pressure builds up is more powerful
than, and not quite the same as, smoothing out a trend.

In fact, there is a fundamental problem in constructing these
dummy variables in that perhaps there ought to be a distinction
between two types of intervention: firstly, day to day (or week to
week) smoothing which is very often the type of intervention reported
in the "Economist"; and secondly, more major operations which may have
involved bucking a trend or at least slowing it down which is the type
of intervention reported by Howson (1980) and Sayers (1976). The
latter is more likely to show up in exchange rate movements whereas
the former may very well not do so. Consequently, there may be a
case for two variants of exchange intervention dummy, one including
only major operations and the other all reported operations with the
first variant more likely to be significant.

Finally, successful exchange intervention may make speculative dummies insignificant since the influences they represent may have been rendered ineffective by such intervention. Alternatively, in cases where no evidence of intervention has been found but it did occur or particularly strong intervention occurred but the intervention dummy does not differentiate between "weak" and "strong" intervention, then if such intervention was successful the speculative dummy may carry the "wrong" sign and in fact be picking up unreported (or very strong) official intervention. This is a multicollinearity problem. To a certain extent this may also apply to the seasonal dummies although it seems unlikely that intervention was strong enough to offset this altogether especially in the light of the large number of contemporary references to seasonal influences.

With the difference between smoothing out and major operations very much in mind, two parallel versions of the three exchange fund activity dummies for the pound-dollar-franc triangle were constructed initially: the first of these was based on information contained in Howson (1980), Sayers (1976) and Lloyds Bank Review and the second on the "Economist" (mainly, but not exclusively, on the foreign exchange column); not surprisingly the latter contained rather more months in which intervention was reported as occurring. A final stage involved examining the dummy variables constructed by Hudgins (1973) and Ozmun (1976) who engaged in a similar task although based on less information. The Ozmun variable was based solely on the "Economist" and so its examination was merely an exercise in double checking but the Hudgins variable added some new information in that it was based not only on the "Economist" but also on the "Commercial and Financial Chronicle" (to which the present author did not have access)

and so the second variant of the intervention dummy for the pound-dollar rate (based on the "Economist") was modified accordingly.

In fact reference to Hudgin's and Ozmun's variables was not very helpful as they do not seem to be entirely reliable and each of them contains apparent mistakes. This is less true of Hudgins' although specific errors can be spotted: for example, in March 1933 the only relevant comment that could be found referred to Control offsetting a big demand for sterling by selling pounds[11] which implies a value of -1 in Hudgin's dummy but in fact it carries a value of +1 whilst in November 1938 a reference to official support for the pound (in the "Economist") seems to have been missed. Furthermore, Hudgins' "joint" intervention dummy is not constructed as he himself describes.[12] A more fundamental criticism relates to the January 1934 to September 1936 period when Hudgins' dummy registers official British intervention in the pound-dollar exchange for 19 of the 32 months and yet the EEA was operating only in francs at this time.[13] The explanation of this would seem to be that Hudgins was assuming that, as the franc and dollar were both linked to gold, intervention in the pound-franc exchange would affect the pound-dollar exchange rate through arbitrage but then why does he not retain this assumption during other periods when the dollar and franc were both linked to gold (such as February 1937)? In any case, a preferable approach would seem to be to construct a separate pound-franc intervention dummy and to include that in the pound-dollar equation to test directly for significance of pound-franc intervention in the determination of the pound-dollar exchange rate (although this has the disadvantage of not separating out the periods in which such a relationship may have occurred - particularly 1934-36 - from other

periods when it may not have, that is, those in which the dollar
and franc were not both linked to gold).

As indicated above the Ozmun dummy variable for pound-franc
intervention is based on no unavailable or unused source and so it
was only examined to double-check. Unfortunately this proved con-
fusing as it contained many apparent errors. To give one example,
in March 1933 the EEA bought francs (Ozmun, 1976, p. 33) and in March
1934 it sold francs (Ozmun, 1976, p. 34) so why, with no other
activity reported in the "Economist" for these months, does Ozmun's
EEA dummy carry the same sign (minus) in both these months? There
are numerous other inconsistencies and ultimately it was decided to
ignore Ozmun's dummy variable.

To summarize: two versions of the three main intervention dummies
will be constructed, the first based on Sayers (1976), Howson (1980)
and Lloyds Bank Review, the second based on the "Economist" with the
pound-dollar variable modified slightly by reference to Hudgins (1973).
Two variables proper will then be used in the regressions: a "narrow"
intervention dummy based on the first of the two versions and a "wide"
intervention dummy based on both and therefore on all information that
could be found. A further possible variation - involving the use of
different values to represent different reported strengths of inter-
vention (as was done by Hudgins and Ozmun) - was rejected as being
far too subjective. In the empirical tests the "wide" version will
be preferred but in the cases where this performs badly the "narrow"
version will be tried.

The exchange fund dummies for exchange rates involving the
"minor" currencies contained few observations and were mainly derived

from information in the "Economist" although occasional reference
to minor currency intervention was found elsewhere - for example,
Lloyds Bank Review notes that the belga was being supported in May,
1938. Finally variables reflecting the activities of individual
exchange funds were not constructed but rather intervention in a
particular exchange rate by all the relevant authorities formed the
basis of the exchange intervention dummies; consequently, these are
"joint" variables in that they measure, in the case of the pound-
dollar rate for example, the combined activities of the EEA and the
American Stabilisation Fund and therefore provide a test for the
importance of official intervention in itself, rather than testing
for the significance of the operations of individual countries'
intervention funds. All the exchange intervention dummies are
reproduced in Appendix I.

FOOTNOTES TO APPENDIX

1. See Ozmun (1976) pp. 26-7, Hudgins (1973) pp. 57-9, Economist 26/12/36 p. 640 and 16/1/37 pp. 115-6.

2. Sayers (1976) p. 430.

3. Hudgins (1973) p. 52.

4. Comstock (1933) p. 620. For other expressions of this view, both contemporary and more recent, see n. 30 of Ch. 4.

5. Economist 3/3/34, p. 461. See also the Economist's "EEA Supplement" (5/5/34).

6. In fact, beating the speculators (and thereby discouraging destabilising speculation) was sometimes a major preoccupation of EEA policy. See Howson (1980) pp. 46-7 for examples of this.

7. Howson (1980) p. 22.

8. Sayers (1976) p. 470.

9. Two references in Clarke (1977) on p. 2 (Jan., Feb., March, 1933) and on p. 10 (June, 1936) were also noted; these backed up evidence in Lloyds Bank Review. Reference was also made to a series of contemporary articles by F.W. Paish in "Economica" (1935, 1936, 1937) but these were not very useful and, according to the Economist (16/12/35, p. 35), inaccurate anyway.

10. Howson (1980) p. 16, p. 22, p. 24 and Sayers (1976) p. 563 respectively.

11. Economist 4/3/33, p. 446. This is supported by evidence contained in Lloyds Bank Review (April, 1933, p. 152) and Clarke (1977) p. 2.

12. According to Hudgins (1973, p. 232) this should carry a positive sign when the pound was being supported and the dollar depressed, and presumably a negative sign when the dollar was being supported and the pound depressed. In fact close examination of this variable (Hudgins, 1973, Table A21, p. 255) suggests that the opposite is true.

13. This does not mean to say that the American authorities did not occasionally intervene to influence the pound-dollar exchange rate in this period.

CHAPTER 5

THE POUND-DOLLAR-FRANC TRIANGLE

(I)

The three most important currencies in the 1930's were the
pound, the (US) dollar and the (French) franc. These were the curr-
encies most frequently used for trading purposes and also to which
other (minor) currencies tended to be pegged.[1] It is therefore
appropriate that the relationship between these three be examined
first and, in fact, provide the main testing ground for the model.
Broadly speaking, the international monetary system in the first half
of the 1930's can be described as comprising of five different groupings:
the exchange control countries (to which the model developed here is
obviously not applicable), the countries on a silver standard (such as
Mexico and China which were peripheral and therefore of less interest)
and the groups of countries attached to each of the three major currencies.

The most formally defined of these was the gold bloc which was
officially formed in 1933 following the collapse of the London Conference
when it became clear that an orderly return to fixed exchange rates was
not to be forthcoming. Consequently, a number of countries (led by
France) declared their intention to maintain their pre-1931 parities
with gold and the gold bloc came into existence, Less formally defined,
though considerably larger, was the sterling area, which included the
Empire (except Canada) and some foreign countries (notably in Scandinavia)
for whom Britain was the major trading partner. Finally, there was the
dollar grouping which consisted of the dollar and a rather smaller
number of satellite countries. Although this situation was modified

somewhat following the Tripartite Agreement in 1936, the pound-dollar-franc triangle remained at the centre of the system.

The degree to which any of these currencies were freely floating is actually very limited: this was only true of the pound from September, 1931 to spring, 1932 (when the EEA was established), of the dollar from April, 1933 to January, 1934 (or more strictly October, 1933 if the Roosevelt Administration's gold buying policy is taken into account), and of the franc from July, 1937 to early May, 1938 (though even then there was occasional official intervention by the French stabilisation fund). Moreover, if the EEA's activities are fully taken into account then managing the pound must inevitably have affected the franc and the dollar and so the latter two countries were never freely floating against the pound. Nevertheless, to the extent that official intervention and any obvious period of under or over-valuation can be captured by dummy variables, the model developed in the preceding chapter can usefully be applied to all three "sides" of the triangle.

The three exchange rates are presented graphically in Figure 5.1 for the period July, 1931 to December, 1938. As they are obviously interrelated an overview of their general movements is more easily presented in terms of what was happening in a given sub-period rather than by looking at the individual currencies. (A detailed account of the specific movements of each currency is provided in the next section). The first sub-period runs from September, 1931 to March, 1933 and began with Britain abandoning the gold standard. By the end of 1931 the pound had dropped by about a third of its gold standard value against both the franc and the dollar. There was a brief recovery in the spring of 1932 but the pound had dropped back to its December, 1931 level (or rather slightly below it) by the end of that year. The franc-dollar
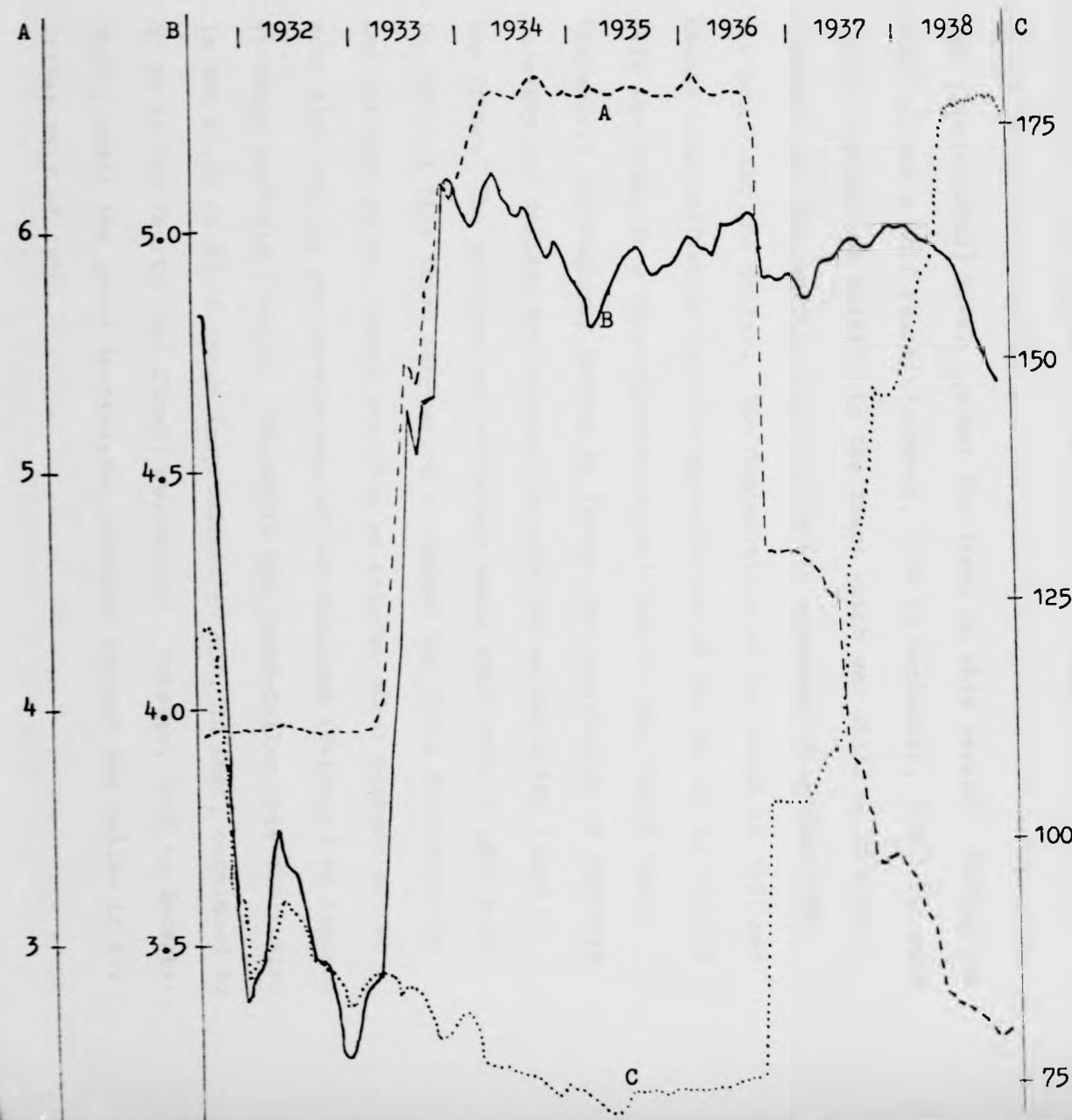
FIGURE 5.1

POUND-DOLLAR-FRANC EXCHANGE
RATES (July, 1931-Dec., 1938)

A = franc-dollar (cents per franc)

B = pound-dollar (dollars per pound)

C = pound-franc (francs per pound)

exchange rate was not especially affected by the pound's depreciation in this period as the two currencies both remained on the gold standard and so their rate of exchange fluctuated only slightly around its par value.

The next sub-period runs from April, 1933 to January, 1934; it begins with the US leaving the gold standard and ends with its return, the dollar having depreciated by some 40 per cent. Obviously this affected both the pound-dollar and franc-dollar exchange rates and furthermore, ushered in a period during which the dollar was clearly undervalued. The pound-franc rate was, of course, little affected by the dollar depreciation and the pound remained at more or less the same (depreciated) level against the franc in this period. During the next two and a half years (February, 1934 to September, 1936) the main focus of attention shifted to the franc which was still on the gold standard and subsequently had effectively appreciated against both the pound and the dollar. The depreciation of the pound in 1931 had caused some difficulty but the depreciation of the dollar in 1933-34 left the franc in a very vulnerable position and the French found themselves increasingly having to forego the possibility of domestic recovery and deflate the economy in order to maintain the value of the franc. The problems had obviously begun when Britain left gold in 1931 but this third sub-period witnessed the final deterioration and collapse of the French position as several other members of the gold bloc fell by the wayside and either devalued (Belgium) or imposed exchange controls (Italy). Meanwhile the pound-dollar rate fluctuated in the $4.80 to $5.10 range (approximately) and, in fact, continued to do so in the fourth (and final) sub-period - October, 1936 to December, 1938 - until the pound depreciated somewhat against the dollar in the latter half of 1938.

In September, 1936, the Tripartite Agreement was announced
which marked a return to co-operation and the end of unilateral
exchange rate changes. By mutual consent, the franc was devalued
but this action proved to be insufficient to restore even relative
stability and consequently, although the co-operation continued, the
depreciation of the franc also continued against both the pound and
the dollar until mid-1938. In conclusion, it is clear that there was
considerable fluctuation in all of the three major exchange rates in
the 1930's and hence they are well suited to econometric analysis.
As indicated above, the next section looks at each currency (and
country) individually and, on the basis of these examination, con-
structs dummy variables to take account of influences which would
not be picked up by "economic fundamentals" but rather reflect
speculative factors.

(II)

On September, 21st, 1931, Britain left the gold standard and
this marked the beginning of the end as far as the inter-war gold
standard was concerned. Whether Britain had adopted a wise course of
action in returning to gold in the first place is highly dubious.[2]
This particular episode in British monetary history and the reasons
why Britain ultimately abandoned the gold standard are well documented[3]
and need not be repeated here. Suffice it to say that the event was
not entirely unexpected and did not cause the widespread panic that
some had predicted. In the longer run it did contribute to the world-
wide collapse of the gold standard but in the short run the effects
were rather milder: a number of countries (mainly in the Empire and

Scandinavia) also left the gold standard, there was a run on the dollar (which was weathered) and a widespread switch on the Continent from a gold exchange to a gold bullion standard (which contributed to the pressure on the dollar).

The pound itself depreciated rapidly at the end of September but then more or less stabilised in October before falling sharply in November and early December. Although seasonal sales of pounds were a factor, the depreciation of the pound in November-December, 1931 was arguably caused largely by temporary and speculative factors. These included speculative sales of pounds by people who had bought before the general election (thereby stabilising the pound in October) anticipating a government victory and who now feared inflation, the liquidation of sterling balances in Amsterdam (in December) and a rush of imports to beat the (imminent) tariff. Thus, it seems fair to conclude that:

> "....on balance sterling fell during the closing months
> of 1931 under the pressure of non-recurrent forces, which
> by now /Jan., 1932/ should have largely spent themselves.
> In these circumstances it is not unduly optimistic to look
> for a rally in sterling to its 'natural' level". (4)

This is precisely what happened. The rising trend in the pound began, in fact, in late December and reached its peak with the "most sensational developments"[5] in early March. To some extent this reflected the lack of the normal demand for imports, many of which had been bought in the rush to beat the tariff. However, the major cause of this appreciation seems to have been a change in speculative sentiment:

> "A more important role, however, in causing the recovery
> of sterling has been played by capital transactions, in
> whose case psychological factors are of primary importance...
> very few foreign observers believed that we should be able
> to avoid inflation; and the absence of any appreciable price
> rise here has created an unexpectedly favourable impression
> abroad". (6)

It therefore appears that, due largely to speculative factors,
the pound was at an artificially low level in the December, 1931 to
February, 1932 period and this marks the first British speculative
dummy. From April (1932) to the end of the year the pound became
much less erratic and depreciated gradually with no apparent major
bout of speculation-induced variation.[7]

In 1933 the foreign exchanges were dominated by events in
America and any tendency of the pound to depreciate (or appreciate)
due to "British" speculative influences is likely to be swamped (or
amplified) by movements in the dollar. However, during part of the
period immediately preceding the American devaluation (Jan.-Feb., 1933),
the pound did show a tendency to appreciate due to a capital inflow
and was "very strong against all countries":[8]

> "There is little doubt that the main factor in the recent
> tendency of sterling to appreciate has been an influx of
> capital....." (9)

This period will constitute the second British speculative dummy. The
only other incident of interest was a tendency of the pound to weaken
against the Continental currencies in September but the Continent
itself seems to have believed that this was to some extent seasonal[10]
and, since the pound staged a recovery in both the middle and at the
end of the month,[11] no dummy variable appears justified.

The year 1934 saw some disequilibrium with the pound overvalued
against the dollar but undervalued against the franc but nevertheless:

> "Taking the year as a whole.....the pound displayed marked
> stability". (12)

However, in the middle of the year the pound appeared to deviate from

this stable trend. In May, a "fall in sterling against the dollar and to some extent against the French franc"[13] was reported and this weakness continued through June and was "...to some extent psychological".[14] This was caused by a combination of temporary factors (such as US profit taking on the London stock exchange) and speculative influences induced, for example, by a warning of the potential vulnerability of the pound in the form of a suggestion in a B.I.S. report that the level of sterling balances held by foreigners in London had become as high as it had been in 1930.[15] The weakness recurred in August and, although it was partly seasonal, it was aggravated by speculative sales of pounds on the Continent associated with fears of a devaluation of the pound (to offset intensified American competition due to a further dollar devaluation thought to be likely). In September, however, the pound appears to have recovered and indeed strengthened slightly in the last quarter of 1934. Consequently, a third British dummy will be constructed to cover the pound's weakness in the May to August, 1934 period.

Sterling weakened again in the first three months of 1935 but this was largely a reflection of dollar strength associated with the impending gold clause judgement (and is therefore picked up by an American dummy). However, the origin of the weakness was partly British and so a British dummy variable may be appropriate as the pound's relationship against Continental currencies may have also been affected. This was especially true of March when the "depreciation of the pound....proceeded so rapidly....that it....attained the status of 'front page news' ".[16] The reasons for the weakness were "of a psychological character.../with/...foreign confidence in sterling receiving a sudden shock through a combination of circumstances"[17]

including events on the Stock Exchange and rumours of an early
general election. In view of all this, it seems prudent to con-
struct a fourth dummy variable for March, 1935. There was one further
bout of (much less marked) sterling weakness in 1935 (Sept.-Oct.) but
this was partly seasonal and partly due to nervousness in Europe
generally caused by the Italy-Ethiopia dispute, and is therefore
more appropriately viewed as dollar strength.

In 1936 attention in the foreign exchange market shifted to
the gold bloc and disturbances emanated mainly from this source and
will consequently be picked up by non-British dummies. This was also
true of 1937 when the pound:

> "preserved an even tenor, any possible consequences of the
> year's adverse trade balance being completely offset by
> international capital movements". (18)

More importantly, the reasons for these capital movements were
external in origin and are therefore picked up elsewhere; they include
a gold scare in the form of a rumour that the US buying price of gold
was about to be lowered and a capital flight from France due to un-
certainties there. The major speculative influence on the pound in
1938 occurred in the last quarter of the year and is (once again)
better viewed as having an external origin:

> "While it is natural to speak of the recent exchange
> movements as a depreciation of sterling it would be much
> more correct to describe the past fortnight as having
> witnessed an appreciation of the dollar. Such a
> description is justified, because the compelling force
> upon the exchanges has been the general flight of funds
> from Europe, rather than from England, to the United
> States". (19)

Thus there are no British speculative dummies for 1936, 1937 or 1938.
The British dummies are summarized in Table 5.1 below.

TABLE 5.1 : BRITISH SPECULATIVE DUMMIES

VARIABLE	PERIOD ON	TENDENCY OF £	REASON
K1	Dec. 1931-Feb. 1932	weak	Fears of inflation; rush of imports to beat the tariff.
K2	Jan.-Feb. 1933	strong	Capital inflow.
K3	May-Aug. 1934	weak	Temporary factors; fears of inflation; reports of the pound's vulnerability.
K4	Mar. 1935	weak	Loss of confidence in the pound (various reasons).

The Americans reacted quietly (though with some surprise) to Britain leaving gold; they took the view that Britain's position justi-fied her action and consequently there was no great tendency to criticise.[20] That is not to say that the British action did not have consequences for the dollar: on the fall of the pound, attention shifted to dollar and in October there was a large drain of gold from the U.S.(particularly to France), as numerous European currencies converted from a gold exchange to a gold bullion standard and consequently began to change devisen into gold at a great rate. There were also other reasons for the dollar to weaken including a loss of confidence in the American banks - "It is true that in certain respects the American banking position has been causing misgivings"[21] - and a belief that Hoover's new economic proposals, particularly the formation of the National Credit Corporation, "represent/ed7 the administration of a mild dose of inflation".[22] The outflow of gold (to Europe) continued until the end of the year but October was the month when the dollar seemed under the greatest pressure

and, to some extent, the outflow to Europe was being offset by an
inflow from Japan by November. Thus October, 1931 marks the first
American speculative dummy.[23]

The year 1932 was one of two halves for the dollar which tended
towards weakness until mid-June and then recovered in the second half
of the year. The beginning of the U.S. policy of credit expansion
(Hoover's version) in January and the passing of the Glass-Steagle
Act, which permitted a further expansion of Federal reserve credit,
in February led to some misgivings about the dollar, but the real
weakness seems to have developed in April-May after it had been
revealed that the American budget was unbalanced. This appears to
have led to a minor run on the dollar and therefore April-May, 1932
marks the second American speculative dummy. The dollar then recovered
in mid-June and maintained its position due to a combination of the
balancing of the budget, low British interest rates (the cheap money
policy) and seasonal demand for dollars - the latter two influences
being picked up by other variables in the model - and also the fact
that the process of running down her New York balances, which had
been undertaken by France in the first half of the year, came to an
end. This recovery was interrupted in October when Hoover revealed
that the U.S. had come close to abandoning the gold standard in the
spring but the consequent speculative movement of funds against the
dollar was short-lived and recovery was swift.

The next five months cover the interregnum between Roosevelt's
election and his taking office. This was a period of some uncertainty
aggravated by the lack of co-operation between the President and President-
elect over the two major problems of the period - the war debt defaults
and the banking failures - with the latter apparently causing the dollar

to weaken in January-February 1933. Thus, there is a case for
treating the whole period as one of expected dollar weakness although
it may be argued that, given the extent of Roosevelt's electoral
victory, a period of dollar strength in anticipation of his eventually
taking power might have occurred. Either way, a dummy variable for the
November, 1932 to March, 1933 period is appropriate with the probability
(though not certainty) of it being associated with dollar weakness.

On April 19th, 1933 the gold standard was formally suspended
in the U.S. In spite of the banking crises, the dollar was not forced
off gold, as the pound had been before it, but rather it was a conscious
act of policy.[24] A nine month period of depreciation then took place
until the dollar was restabilised in January, 1934; the depreciation
was a rather uneven affair and was particularly rapid in the period
immediately following the suspension of the gold standard and again
in the October-November (1933) period, but with a pause in the early
autumn and even a slight recovery in December. The rapid depreciation
of the dollar in the April-June period was undoubtedly related, to some
extent, to rises in U.S. prices (particularly wholesale prices although
the cost-of-living index also rose) and to the rise in employment indices
(which proxy income). However, the tendencies encouraged by the movements
of these indices were aggravated by capital movements: there was a flight
of U.S. capital out of the country, a withdrawal of foreign capital
invested in American securities, a widespread failure to repatriate
the proceeds of American export sales and also an element of purely
"speculative" capital outflow. This continued until the early autumn
when the depreciation came to a temporary halt due partly to bears of
dollars covering their position and also the beginning of seasonal
purchases of dollars but mainly because of rumours of impending stabili-
sation of the dollar.

In fact such rumours proved to be totally incorrect, since
in late October Roosevelt announced a new policy of official gold
purchases with the stated objective of depreciating the dollar and,
for the next six weeks, deliberate government policy and a fresh
flight of capital combined to cause a second phase of rapid dollar
depreciation until it was stabilised at 59.06 per cent of its old
value (in terms of gold) in January, 1934. There was no rise in the
American price indices or income proxies during this second phase of
rapid depreciation which suggests that it was due wholly to "non-
economic fundamental" causes. Consequently, according to many
sources,[25] the dollar entered into a period during which it was
considerably undervalued which lasted (approximately) until the end
of 1934.[26] This undervaluation of the dollar overshadows any
tendency of the dollar to fluctuate (for speculative reasons) in
1934 although it should be pointed out that fears of inflation did
cause the dollar to weaken slightly in three months - April, August
and October.[27] Thus it is clear that the whole of the April 1933
to December 1934 period was one of dollar undervaluation at least in
part because of speculative factors, although this applies less to the
first phase of rapid depreciation (April-June, 1933) than the second
(November, 1933 to January, 1934). Therefore it seems plausible to
construct two dummy variables - S4 (April-October, 1933) and S5
(November, 1933-December, 1934) - to allow for the implication of
this which is that the degree of undervaluation may well have differed
between the two sub-periods (being less for the first that the second).

In the next two years attention in the foreign exchange shifted
to the gold bloc and therefore much of the speculative influence on
the dollar is picked up elswhere. Nevertheless, there are two periods

which would seem to merit an American speculative dummy. Firstly,
there was the uncertainty caused at the beginning of 1935 by the
impending Gold Clause Judgement.[28] Had the decision gone against
the government, there was a widespread feeling that the dollar would
have been revalued (in terms of gold) and, consequently, speculative
funds flowed into New York. On February 18th, the Supreme Court
ruled narrowly (and controversially) in favour of the government and
this removed any likelihood of revaluation. However, there was
surprisingly no reaction against the dollar in the second half of
the month:

> "...contrary to previous expectations, there was no great
> rush to sell dollars..." (29)

> "...there was comparatively little selling of dollars....
> This suggests that there has been a genuine movement of
> funds from Europe to the United States..." (30)

Indeed, according to one source,[31] the tendency of the dollar to
appreciate continued until April (encouraged by the belga devaluation
in 1935) and consequently, the sixth American dummy runs from January
to April, 1935.

There were then a series of months during which the dollar may
have been affected by speculative capital flows caused by various
"non-economic fundamental" events: the American silver purchases in
July, the nervousness in Europe in autumn caused by the Italy-Ethiopia
conflict, fears of inflation in January-February, 1936 stemming from
the passing of the Veteran's Bonus Bill with the consequent emergence
of a budget deficit and the tendency of the dollar to weaken against
the pound in sympathy with the franc in mid-1936. However, none of
these events seem to have exerted a strong enough effect to merit

a dummy variable or, in one case (the Italy-Ethiopia war), the influence is likely to be picked up elsewhere. In fact, other than the Gold Clause Judgement, the only incident that would seem to require a speculative dummy in the 1935-36 period is the large inflow of "hot money" in October-November, 1936 which was of "a non-recurrent nature"[32] and, to some extent, even this is more a gold bloc phenomenon than an American one.

In December, 1936 a programme of gold sterilization was introduced to prevent further gold inflows from creating excess reserves and in January, 1937 the Federal Reserve Board raised reserve requirements. However, the gold inflow continued in the first three months of 1937 and reached its height with the gold scares of (particularly) April and late May/early June. These "gold scares" involved rumours of a cessation of gold purchases and a drop in the dollar price of gold (and hence a dollar appreciation). This would seem to suggest a dummy variable for the whole of the January-June, 1937 period to take account of dollar strength.

In late 1937, however, the tendency of the dollar reversed itself:

> "This second 'gold scare' reversed itself into a 'dollar scare' late in the same year, after the stock market and business activity had slumped in the United States and some fear had arisen that the dollar might be devalued against gold as an antirecession measure. The speculative outflow of funds from the United States continued through the first half of 1938 and in the ten months up to July amounted to nearly $1 billion". (33)

This trend in the dollar was accelerated in April (1938) by Roosevelt's announcement of a new programme of "pump-priming" which was felt by many to be "inflationary in character"[34] and by early June:

"The general feeling on the Continent is that sooner
or later the dollar will once more be devalued. Early
in the week there were strong rumours to this effect..." (35)

All this would suggest a further dummy variable for the October, 1937
to July, 1938 period to reflect dollar weakness.

The last five months of 1938 marked a political crisis in
Europe and a consequent flow of funds to America. It began in August
when "a world-wide rush into dollars and gold"[36] was reported which
extended into September and reached its peak in early October when it
was observed that:

"It is no longer a question of the flight of hot money.
Instead balances which have been held in London for years
are now migrating to New York". (37)

The nervousness in Europe (and capital outflow) was apparent throughout
October even after the Munich Agreement and "continued at a slackened
rate in November and December".[38] Therefore a final American dummy
will be constructed for the August-December, 1938 period to reflect dollar
strength. The American speculative dummies are summarized in Table
5.2 below.

TABLE 5.2: AMERICAN SPECULATIVE DUMMIES

VARIABLE	PERIOD ON	TENDENCY OF DOLLAR	REASON
S1	Oct. 1931	weak	Gold outflow (aftermath of pound's depreciation).
S2	Apr.-May 1932	weak	Fears of inflation; unbalanced budget.
S3	Nov. 1932-Mar. 1933	weak	Interregnum.
S4	Apr.-Oct. 1933	weak	Undervaluation.
S5	Nov. 1933-Dec. 1934	weak	Undervaluation.
S6	Jan.-Apr. 1935	strong	Gold clause judgement.
S7	Oct.-Nov. 1936	strong	Inflow of "hot money".
S8	Jan.-June 1937	strong	"Gold scares".
S9	Oct. 1937-July 1938	weak	"Dollar scare".
S10	Aug.-Dec. 1938	strong	Political tension in Europe

In many ways the experience of France in the 1930's contrasts sharply with that of Britain and the U.S.A. The depression did not reach France until fairly late but then lasted throughout the decade until a kind of recovery was brought about by rearmament in 1938. There was no cheap money policy or New Deal to facilitate recovery; indeed, there was "unbelievable ignorance of economic questions in business as well as political circles"[39] and consequently no-one (not even exporters) wanted devaluation and, in the face of an over-valued currency for much of the period, the only alternative was deflation. This was pursued by a succession of governments and there were certainly plenty of these in France in the 1930's - nineteen different administrations in all in the September, 1931 to December, 1938 period. In fact political instability was a well-known feature of France at this time:

> "A political wit once remarked that in France the Budget
> is always well on the way to being balanced, and that in
> the political sphere, France is generally in a state of
> crisis, with occasional lapses into stable government". (40)

One might therefore expect a large number of speculative dummies for France and this does rather turn out to be the case.

Examining events in more detail, the British devaluation in September, 1931, despite its longer run implications, does not seem to have had a dramatic effect on the franc; the U.S.A. was still on the gold standard, the French economy was still not feeling the full effects of the depression and, in any case, France still had ample gold reserves to deal with any run on the franc that might develop. Nevertheless, a shift towards deflationary policies was begun and, in the second half of 1932, Herriot's government continued the half-hearted attempt to institute budgetary equilibrium begun by the preceding

Tardieu and Laval administrations. However, Herriot's slim and
shifting majority proved insufficient and, in late 1932, his
policies and his government were defeated. This marks the first
of the French dummies (November-December, 1932) which is associated
with franc weakness.

The difficulties continued into 1933 and, in the January 1933-
February, 1934 period a succession of governments (five in all) tried
and failed to impose fiscal cuts in an attempt to deflate the economy
and maintain the position of the franc. The situation was clearly
worsened by the depreciation of the dollar and matters came to a
head in late 1933 when a contemporary article, entitled "The French
Crisis", suggested:

> "The present crisis in France has its origin in two
> distinct factors.....the Budget disequilibrium....and....
> the....factor of group-politics". (41)

Confidence was further undermined by an element of social unrest
which eventually led to riots.[42] Thus it appears likely that the
franc may also have weakened because of "non-economic fundamental"
influences in November-December, 1933 and the second French dummy
covers this period.

In March, 1934, Gaston Doumergue, the ex-President, came out
of political retirement to form a "Cabinet of National Union" and
the presence of a "strong man" had the desired effect.[43] The budget
situation was improved, confidence returned and the franc strengthened.[44]
The Doumergue government lasted until late October when it fell in an
unsuccessful attempt to get further fiscal cuts and the whole period
(March-October, 1934) forms the third French dummy. In November,
Flandin took office and, whilst he accepted deflation and a movement

towards budgetary equilibrium, he did engage in a mild attempt at reflation in some areas, lowering long term interest rates for example.

However, in 1935 outside events began to overtake France once again and at the end of March of that year Belgium devalued. This immediately put pressure on the rest of the gold bloc[45] including a run on the franc which reached alarming proportions, encouraged by the Communist victories in the May municipal elections, and between May 20th and May 24th alone, the Bank of France lost $1\frac{1}{2}$ billion francs. At the end of May Flandin fell, to be replaced by Laval on June 7th after a new government under Buisson which only lasted a few days. The Laval administration initiated a policy of savage deflation and this constituted the last sustained attempt to solve French problems by "orthodox" means. It was done by a series of decree laws - 549 in all - that affected nearly every part of the French economy and administration. Unfortunately, Laval was ultimately unsuccessful and there was no attempt to renew the powers of decree when they expired in October. The effect the Laval deflation had on confidence and therefore the franc is debateable. There is evidence that it distilled confidence in that the French Central Bank was able to lower Bank Rate in August, 1935, but on the other hand, there are contemporary reports of a weak franc.[46]

However, the franc certainly does appear to have weakened in the following month (November):

"The political situation in France is now causing some anxiety". (47)

"The franc....was seriously affected by new doubts concerning the general French financial outlook. Between October 25th and November 15th, the Banque de France lost Frs. 1,769 millions of gold...." (48)

To summarize, the franc would seem to require three speculative dummies for 1935: two of these to reflect weakness - April-May and November - due to the aftermath of the belga devaluation and political and financial uncertainties respectively and one, associated with the Laval deflation (June- October) of uncertain sign.

In early 1936 the franc appears to have weakened again. The January decrease in Bank Rate was soon proved to be premature and, at the end of the month, "the French Governmental crisis....accentuated nervousness over the franc".[49] The weakness continued through February and March, aggravated by rumours of devaluation and the nervousness due to the German reoccupation of the Rhineland.[50] A seventh dummy will therefore cover the January-March, 1936 period. However, the real difficulties for the franc in 1936 came later in the year after the election of the Popular Front in late May which was to govern for nearly two years with ultimately little success.

The first Blum administration (June, 1936-June, 1937) is associated with the "Blum experiment" and has been split into three sub-periods.[51] In the first, June to September, 1936, business recovery and social reform were viewed as going hand in hand. Consequently, a number of reflationary measures were introduced in June including wage increases (the Matignon agreements) and the introduction of a forty hour week "in principle". This new reflationary policy was not a success: confidence was not revived and, in fact, production fell,unemployment increased and there were intermittent flights from the franc throughout the whole period (despite a brief rally in July).[52]

Following the Tripartite Agreement of September 26th, the franc

was devalued on October 1st and the Poincaré franc with a fixed
gold content ($65\frac{1}{2}$ mg.) was replaced by the Auriol "elastic franc"
franc, so called because it was fixed only within limits (43 mg.-
49 mg.); a stabilisation fund was also established. This marks
the beginning of the next sub-period (October, 1936-February, 1937)
which witnessed the general enforcement of the forty hour week and
a brief, uneven (and temporary) revival of the economy. As far as
the experience of the franc is concerned the period needs to be split
in half. From October to December, 1936 there is conflicted evidence:
on the one hand, there is some evidence that the capital outflow, if
not quite reversing itself, at least temporarily came to halt;[53] on
the other (and in much greater volume) there are reports that the
franc remained weak and the capital outflow continued.[54]

This apparent continued weakness is not surprising. There were
at least two good reasons for this: firstly, the government's attempt
to penalise gold hoarders by forcing them to surrender it at the old
parity or taxing them heavily discouraged any return of gold and,
secondly, the inexact nature of the French devaluation - the "elastic"
franc - created uncertainty about the precise level at which the franc
would eventually settle, providing scope for further depreciation.
According to one author:

> "It is by no means unlikely that the system of an elastic
> franc....both encouraged speculation against the franc and
> discouraged the return of capital from abroad". (55)

In the first two months of 1937 it was, however, quite clear that
the franc was predominantly weak. On January 29th, the newly
established exchange stabilisation fund was forced to admit that it
had run out of gold in its attempts to support the franc and, through-
out January and February, the French Finance Minister (Auriol) felt

it necessary to wage a campaign against rumours of further
devaluation.

The third sub-period (March-June, 1937) follows the announce-
ment by Blum on February 14th of a "pause" in social reform to allow
present legislation to be "digested". This was another attempt to
boost confidence and in fact some expenditure cuts were made. It
effectively marked the end of the "Blum experiment". It may have
had some beneficial effect but the dominant picture still seems to
have been one of continued franc weakness due to the "confused
political scene in France...∕and∕...the vacillating attitude of
the Government"[56] culminating in a crisis and the collapse of
the Blum government at the end of June. The "elastic" franc was
abandoned and the currency was left free to find its own level. The
whole period of the (first) Blum ministry seems to have been associated
with rumour, uncertainty and consequently speculative influences
generally and four dummy variables would seem appropriate: two of
these (June-September, 1936 and January-February, 1937) are unam-
biguously associated with franc weakness and the other two (October-
December, 1936 and March-June, 1937) are likely to be, although there
were influences working in the opposite direction.

In July, 1937, the new Chautemps regime began by increasing
taxes and restoring the 15% cut in tariffs imposed by Blum. However,
these measures failed to restore confidence which still sagged, largely
because the policies of the Blum government had not been successfully
reversed - there was still a budget deficit and the forty hour week
was still in force. There is ample contemporary evidence to indicate
that the franc remained weak in the July-October, 1937 period[57] and
what seems to have happened is that the June crisis had not been resolved
but merely converted to a situation of low confidence and, therefore, this

period - July-October, 1937 - marks the final French speculative
dummy.

In fact, this weakness was such that the French President felt
it necessary to call the Council of Ministers to his summer chateau
at Rambouillet and to issue an official announcement - the Declaration
of Rambouillet - to the effect that there was no technical or objective
reason for the speculative attack on the franc but even so, the present
government was still determined to solve the country's financial and
economic problems without using exchange controls. This had an immediate
beneficial effect on confidence and coupled with the stock market crash
in New York a few weeks later led to a return of funds to France and a
recovery of the franc in late October which also remained "steady in
November and December".[58] Finally in 1938 there were a number of factors
which may have affected the franc briefly, but nothing of exclusively French
origin that seems likely to have produced a sustained effect on confidence.
The French speculative dummies are summarized in Table 5.3 below.

TABLE 5.3:   FRENCH SPECULATIVE DUMMIES

VARIABLE	PERIOD ON	TENDENCY OF FRANC	REASON
F1	Nov.-Dec. 1932	weak	Defeat of Herriot government and its deflationary policies.
F2	Nov.-Dec. 1933	weak	Budget deficit, difficulties of forming a government, social unrest.
F3	Mar.-Oct. 1934	strong	Doumergue ministry.
F4	Apr.-May 1935	weak	Aftermath of belga devaluation.
F5	June-Oct. 1935	?	Laval deflation.
F6	Nov. 1935	weak	Political and financial uncertainties.
F7	Jan.-Mar. 1936	weak	Rumours of devaluation, nervousness due to German reoccupation of Rhineland
F8	June-Sept.1936	weak	Beginnings of "Blum experiment".
F9	Oct.-Dec. 1936	?	Post-devaluation period.
F10	Jan.-Feb. 1937	weak	Exhaustion of exchange fund reserves, rumours of devaluation.
F11	Mar.-June 1937	?	"Passive" phase of "Blum experiment".
F12	July-Oct. 1937	weak	Aftermath of "Blum experiment".

(III)

Estimation of the model proceeded as follows: two versions of each equation were normally estimated, one using cost-of-living indices, the other wholesale price indices; in the case of the pound-dollar exchange rate, the availability of appropriate data allowed the estimation of a third version using wage indices. The rest of the world was represented by France, the U.S.A. and Britain in the pound-dollar, pound-franc and franc-dollar exchange rates respectively. In the first instance employment indices are used to proxy income, the "wide" version of the official intervention dummies are used and the interest rates are monthly averages of market rates of discount for three month prime bills in the various centres.

Before any computations were undertaken the three sets of speculative dummies were compared to see if there was any overlap (which might explain insignificance in the initial estimates) or direct correspondence (which would imply perfect multicollinearity and therefore that certain variable(s) should be omitted). In fact only one incidence of direct correspondance occurred: this was for the franc-dollar estimates where S8 (January-June, 1937) corresponded exactly to a combination of F10 (January-February, 1937) and F11 (March-June, 1937) and consequently S8 was omitted from the franc-dollar estimates.[59] Having done this, the procedure was then to estimate each version of the different equations with all variables included; the second stage involved omitting the clearly insignificant variables (or more exactly those with a t-statistic less than unity); the third (and final) stage involved experimentation by replacing some of the insignificant proxy variables by alternative proxies (for example, unemployment instead of employment indices for income), omitting more

insignificant variables[60] and ultimately "final" versions of
each equation would emerge (which are presented below).

Before considering the performance of individual variables,
reference should be made to F-tests that were carried out for two
sub-groups: the "economic fundamentals" (prices, national incomes,
interest rates, official intervention and seasonal variables) and the
speculative "non-economic fundamental" (dummy) variables. This seemed
an appropriate preliminary exercise to the extent that the central
hypothesis of the study relates to whether exchange rates were
determined by one or the other (or both) of these groups and, more
fundamentally, lack of significance of either or both groups would
have led to extensive modification of the subsequent estimates. In
fact, both groups of variables were clearly significant for all three
exchange rates. However, it may be worth noting that the F-statistics
were considerably higher for the "economic fundamentals"[61] although
this may be unimportant, given that the speculative dummies probably
only capture part of the total speculative effect.

The single most important exchange rate in the inter-war period
was undoubtedly that between the pound and the dollar and this relation-
ship is therefore discussed first. The first stage estimates produced
results which were reasonably consistent with the general hypothesis
with both "economic" and speculative variables generally significant
(at various levels) and correctly signed, very high coefficients of
correlation and Durbin-Watson statistics towards the top of the
inconclusive range. There was little to choose between the three
different versions of the equation in terms of performance although
the WP (wholesale prices) equation did have a slightly lower standard
error of the regression than the COL (cost of living) and WG (wage indices)
versions.

The performances of individual variables were also satisfactory. The relative income variable and pound-dollar ID (official intervention dummy) were significant and correctly signed in all three versions and the relative price variable in two (WP and WG) although the U.K.-U.S. interest rate differential only in one (COL) and then only at the 10% level. In addition ROW (rest of the world) prices and the pound-franc ID were significant (and negative). ROW income and interest rate differentials were found to be insignificant. Furthermore there was evidence of a seasonal effect: as expected the seasonal variables with larger frequencies (A3 and B3) were not significant but A1, A2 and B2 were. The trend variable was significant and positive. All the speculative dummy variables were significant in one or more equations (although a few were incorrectly signed) with the exception of K2, K4 and S7.[62] The insignificance of the latter is not altogether surprising as it represented an inflow of hot money into the U.S. in the October-November, 1936 period and was, to some extent, a gold bloc rather than American phenomenon. The second stage estimates (not surprisingly) tended to support these initial observations with only one modification: ROW income was proxied by another variable (French production instead of French income) and became significant. The final versions of the pound-dollar equation are presented in Table 5.4.

The importance of relative price and (especially) relative income effects of the kind predicted by the theory (a rise in U.K. prices or income leads to a depreciation of the pound) is clear. The insignificance of the COL ratio undermines this conclusion but, on the other hand, it also illustrates perfectly the necessity to test more than one type of price index. The use of WP's only by many other

TABLE 5.4[1]:   THE POUND-DOLLAR FINAL ESTIMATES

VARIABLE	COL	WP	WAGE
Constant	7.14 (5.71)	7.65 (11.1)	6.51 (11.5)
U.K. prices/U.S. prices	-1.17 (0.89)	-2.38 (3.58)	-0.79 (2.40)
French prices[2]	-1.29 (5.54)	-0.39 (1.53)	-1.46 (6.63)
U.K. income/U.S. income[3]	-1.23 (4.47)	-1.44 (7.23)	-0.60 (1.53)
French income[4]	0.76 (1.31)	0.91 (1.77)	0.53 (0.99)
U.S.-U.K. interest rates	-0.04 (0.84)	0.01 (0.34)	-0.03 (0.69)
Pound-dollar ID[5]	0.05 (2.66)	0.05 (3.07)	0.04 (2.42)
Pound-franc ID[5]	-0.04 (1.87)	-0.03 (1.74)	-0.03 (1.68)
Seasonal variables: A1	-0.06 (2.00)	-0.08 (3.69)	-0.05 (2.24)
A2	-0.04 (2.30)	-0.04 (2.58)	-0.03 (1.86)
B2	0.08 (4.12)	0.07 (4.22)	0.07 (3.99)
Trend	0.02 (12.2)	0.02 (10.2)	0.01 (6.89)
Speculative dummies: K1	-0.43 (4.70)	-0.33 (3.79)	-0.46 (5.38)
K3	-0.15 (1.93)	-0.14 (2.03)	-0.15 (1.99)
S2	0.12 (1.23)	0.16 (1.81)	0.07 (0.79)
S3	-0.22 (2.62)	-0.15 (2.08)	-0.28 (3.89)
S4	0.38 (4.33)	0.42 (5.46)	0.35 (4.34)
S5	0.74 (14.8)	0.64 (13.2)	0.74 (15.7)
S6	0.20 (3.06)	0.11 (1.82)	0.17 (2.68)
S8	-0.18 (2.79)	-0.15 (2.61)	-0.15 (2.40)
S9	0.30 (3.86)	0.21 (3.15)	0.32 (4.28)
S10	0.13 (1.18)	-0.06 (0.69)	0.10 (0.98)
R - SQUARED	0.97	0.98	0.98
DURBIN-WATSON STATISTIC	1.72	1.99	1.67
STANDARD ERROR OF THE REGRESSION	0.112	0.101	1.108
F - STATISTIC	118.5	144.3	127.7

Notes: 1. T-statistics in brackets.

2. No French wage index was available and so in the WG equation French prices were represented by the French COL index.

3. These are both employment indices.

4. Production index (The employment index was insignificant).

5. These are the "wide" versions (see ch. 4, appendix.)

studies has already been criticised as being at best incomplete
and at worst actually misleading; in fact, had this procedure been
used in the present study, one might have (wrongly) concluded that
there was strong support for a relative price effect and been (quite
rightly) subject to the criticism, that the bias of WP prices towards
traded goods makes the correlation spurious. The use of only WP
and COL versions would have strengthened this criticism. However,
the inclusion of a wage version pre-empts it since the wage index
contains even less traded goods than a COL index (none, to be precise).
Consequently, it can be argued that the results in Table 5.4 illustrate
that whether a price index based on traded goods (WP) or non-traded
goods (WG) is used there is still evidence of a significant relative
price effect (despite the insignificance of the COL ratio).

The U.K.-U.S. interest rate differential was insignificant.
This was not entirely surprising for at least three reasons: in the
first place, a comparable study of the pound-dollar rate in the 1930's
obtained similar disappointing results;[63] secondly, only one interest
rate (discount rates for three month prime bills) is used to proxy
"the interest rate" and this may be inappropriate; thirdly, and more
fundamentally, it is possible that fears of exchange rate changes
far outweighed the importance of changes in interest rates as an
influence on the movement of short term capital.[64] However the
pound-dollar ID was highly significant (at the 1% or 2% level) and
correctly signed in all three equations, indicating that the presence
of official intervention in any particular month added or subtracted
(depending on direction), on average, approximately five cents to the
exchange rate.[65]

There is also evidence of a significant ROW effect particularly

with reference to prices and official intervention. However, the
ROW income variable did not perform very well: when proxied by
French employment it was insignificant and though the use of a
French production index produced better results, even this was only
significant at low levels in two equations (20% in the COL equation
and 10% in the WP equation) and remained insignificant in the other
(WG). Thus, whilst it can be argued with some certainty that an
increase (decrease) in ROW (French) prices is associated with a
depreciation (appreciation) of the pound against the dollar, one
can only tentatively conclude that an increase (decrease) in ROW
(French) income was possibly associated with an appreciation
(depreciation). ROW interest rates appear to have had no effect;
this is not surprising given the insignificance of the U.K.-U.S.
interest rate differential. The pound-franc intervention dummy
carries an unexpected sign in that it implies attempts to support
the pound against the franc caused it to weaken against the dollar.
This could suggest that the British authorities were successful in
managing the pound-dollar but not the pound-franc exchange rate,
which is not entirely implausible, but must wait until the performance
of the same variable in the pound-franc estimates is considered before
it can be examined more fully.

Three of the seasonal variables were significant and their
combined effect is shown graphically in Fig.5.2(on the assumptions
that A1 = -0.06, A2 =-0.04 and B2 = +0.07, which would seem to be
reasonable compromise values based on their coefficients in the
three different versions of the equation). The main expectation of
seasonal movement in the pound-dollar rate is the well-known (and well
documented) tendency for the pound to weaken in the auntumn and strengthen

FIGURE 5.2

ESTIMATED SEASONAL VARIATION IN THE POUND-DOLLAR
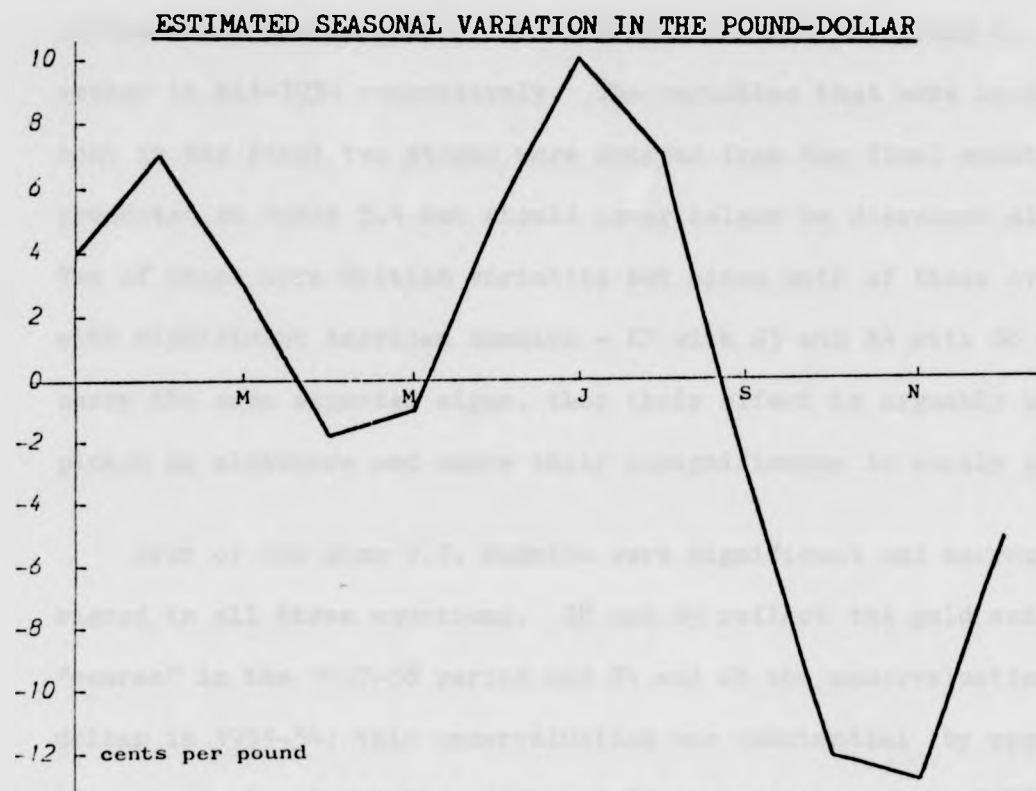
in the spring. The former effect is clearly evident in Fig. 5.2,
the latter less so. There is also evidence of a strengthening of the
pound in the summer although this could be construed as sterling
strength (or at least tendency not to weaken, if full account is
taken of April-May) in the whole of the February-August period, in
which case the sterling autumnal weakness and spring (and summer)
strength hypothesis can be interpreted as being strongly supported.
The trend variable is positive and significant. A gradually depreciating
pound (against the dollar) reflecting growing fears of war in Europe would
have implied a negative sign and so the trend presumably reflects higher
productivity growth in Britain.

The speculative dummies perform very much as expected: they are
mainly significant and, with two exceptions, carry the expected signs.
Two of the British variables are significant, K1 and K3, picking up

the pound's artificial weakness at the turn of 1931 and the
influence of the variety of factors which caused the pound to
weaken in mid-1934 respectively. The variables that were insignifi-
cant in the first two stages were dropped from the final equations
presented in Table 5.4 but should nevertheless be discussed also.
Two of these were British variables but since both of these overlap
with significant American dummies - K2 with S3 and K4 with S6 - and
carry the same expected signs, then their effect is arguably being
picked up elsewhere and hence their insignificance is easily explained.

Four of the nine U.S. dummies were significant and correctly
signed in all three equations. S8 and S9 reflect the gold and dollar
"scares" in the 1937-38 period and S4 and S5 the undervaluation of the
dollar in 1933-34; this undervaluation was substantial (by approximately
40 cents in April-October, 1933 and 70 cents in November, 1933-December,
1934) and, as anticipated, rather larger after the initiation of the
American gold buying policy in late 1933. S2 is also significant
(at the 10% level) in one and correctly signed in all three equations,
suggesting that the expected speculation against the dollar may have
occurred in August-May, 1932. There were two insignificant American
dummies: the insignificance of S7 is not entirely surprising, as this
represented an inflow of "hot money" which was more a gold bloc than
American phenomenon.[66] The other insignificant variable - S10 - was,
in fact, significant and correctly signed in the second stage estimates
and its performance in the final equations was puzzling.

The two final American speculative dummies - S3 and S6 - were
both significant but incorrectly signed. S6 is perhaps easier to
explain. It covers the January-April, 1935 period when there was an
inflow of capital into the U.S. suggesting a negative sign. However,

it immediately follows the 1933-34 period in which the dollar
was undervalued and a positive sign may therefore be construed as
evidence that the undervaluation continued into 1935. In fact, one
can go even further since the much smaller coefficient of S6 (compared
to S5) indicates that the extent of the undervaluation had decreased
from approximately 70 cents to less than 20 cents; the reason for
this rapid correction was presumably, in part, the capital inflow
and paradoxically, therefore, in spite of its "wrong" sign, the
performance of S6 may still be interpreted as providing evidence
of a capital inflow in early 1937.

In the case of S3, which represents the interregnum between
Roosevelt being elected and taking office, some doubt was expressed
about the expected sign in the first place. On balance, dollar weakness
seemed more likely but the possibility that Roosevelt's victory
engendered confidence was put forward. On reflection, this is perhaps
improbable if not impossible, and a more plausible explanation of S3's
sign may be that it is reflecting official intervention supporting
the dollar during a period of weakness (not picked up by the pound-
dollar ID). Indeed, this may turn out to be a reasonable general
explanation of wrongly signed dummy variables, although the size of
the coefficient in this case (0.15-0.28) is considerably larger than
the average size of an intervention indicated by the pound-dollar ID
(0.05). In fact, the coefficients of the speculative dummy variables
are generally much larger than that of the ID; this may suggest that
the pound-dollar exchange rate was occasionally subject to very large
speculative movements which were too big for the authorities to resist.

To summarize, the performance of the individual variables in the
three versions of the pound-dollar equation is very much in keeping

with the expectations about each of them. In more general terms, the contents of Table 5.4 would seem to confirm the view that, whilst the pound-dollar rate was subject to speculative interference on many occasions, it was still largely determined by rational economic influences and in that sense was not violently unstable.

The second most important exchange rate in the 1930's was probably the pound-franc rate and, in general, the application of the model to this relationship was also reasonably successful. In the first and second stage estimates of both versions (COL and WP) there was strong evidence of relative price and interest rate differential effects. The relative income variable was insignificant and so (as in the pound-dollar equations) the French employment index was replaced by a production index to proxy income and this new variable (the ratio of U.K. employment to French production) was significant though wrongly signed. ROW (American) prices and income were significant in the COL version and some seasonal variables, the trend and approximately half the speculative dummies also appeared to be important. The coefficient of correlation was high and Durbin-Watson statistic was in the middle of the indeterminate range. The third and final stage estimates are presented in Table 5.5.

These final equations strongly support the hypothesis that bi-lateral economic influences were major determinants of the exchange rate: the relative price variable is highly significant and the income ratio and French-U.K. interest rate differential are also significant in both versions. Unfortunately the income ratio carries the "wrong" sign (and was insignificant in the earlier estimates when a different French income proxy was used in the earlier estimates), which would imply that a rise in British (French) income led to a decrease in

TABLE 5.5[1]: THE POUND-FRANC FINAL ESTIMATES

VARIABLE	COL	WP
Constant	158.0 (10.1)	177.8 (15.7)
U.K. prices/French prices	-175.0 (27.2)	-119.1 (20.7)
U.S. prices	132.5 (4.89)	11.3 (0.33)
U.K. income/French income[2]	13.4 (2.08)	18.7 (2.63)
U.S. income[3]	-45.5 (3.68)	-9.07 (0.48)
French-U.K. interest rates	-1.21 (2.12)	-2.64 (4.52)
Seasonal variables: A1	-0.38 (0.52)	-2.88 (3.62)
B1	3.19 (4.49)	1.93 (2.37)
B2	-1.23 (2.01)	-0.78 (1.08)
Trend	0.70 (12.4)	0.74 (9.79)
Speculative dummies: K2	4.71 (1.63)	0.83 (0.24)
F3	-9.42 (5.72)	-8.78 (4.97)
F5	8.19 (3.57)	8.05 (3.10)
F6	11.4 (2.86)	9.91 (2.15)
F7	5.10 (1.96)	0.04 (0.01)
F8	-11.0 (4.65)	-17.4 (6.09)
F9	1.34 (0.52)	-9.30 (2.99)
F10	-8.82 (2.97)	-16.9 (5.04)
F11	-15.7 (6.59)	-13.7 (4.99)
R - SQUARED	0.99	0.99
DURBIN-WATSON STATISTIC	1.38	1.34
STANDARD ERROR OF THE REGRESSION	3.64	4.19
F - STATISTIC	400.5	301.5

Notes: 1.   T-statistics in brackets.

2.   U.K. employment index and French production index.

3.   U.S. employment index.

demand for French (British) goods; such widespread existence of negative income effects would seem highly unlikely, although it is probably that only one of the two income variables is behaving like this and, had the variable been broken down with French and British income included separately in the regression, this might have been apparent.

Nevertheless, the implication still remains an odd one and the most likely explanation would seem to be that the income effects on the pound-franc exchange rate were being distorted by government intervention (trade controls and exchange fund activity), even though this does not seem to have occurred for the pound-dollar and franc-dollar rates where the income ratios were significant and correctly signed.[67] Some solace may be drawn from Ozmun's study which, using the same data for the same period, strangely obtained the opposite results, finding significant and correctly signed income ratios whether French employment or production indices were used[68] although, to some extent, this only adds to the confusion.

The French-U.K. interest rate differential, on the other hand, is significant and correctly signed, the only bi-lateral interest rate to be so in the pound-dollar-franc triangle. This is not surprising as there are numerous contemporary reports of the authorities raising the discount rate during periods of franc weakness[69] and this result would indicate the success of such measures. However, this conflicts with Ozmun's study which found the same variable to be insignificant and incorrectly signed. He consequently suggested that:

> "The discount rate was normally raised in response to depreciations of the franc and was therefore viewed by speculators as a signal that the franc was in trouble". (70)

This argument is not unattractive but the results in Table 5.5 would appear to contradict it.

There is some evidence of a ROW effect in that ROW prices and income are significant in the COL equations suggesting that a rise in ROW prices and a fall in ROW income were associated with a franc depreciation against the pound. The less marked ROW effect compared with the pound-dollar exchange rate may reflect the choice of the ROW proxy: conscious efforts were avowedly made by France to expand links with the rest of the gold bloc and so some account of the gold bloc should possibly have been taken into considerations in formulating the ROW proxies.[71] ROW interest rates appeared to play no role in determining the pound-franc rate (which was also the case for the pound-dollar rate). The trend variable is positive and significant indicating a secular decline of the franc against the pound; this may indicate higher British productivity (as in the pound-dollar case), increasing war scare on the continent - one would have anticipated a flow of funds to America but this might have occurred via Britain - or that the franc was overvalued in 1931 and this was gradually corrected throughout the sample period.

There is also evidence of a seasonal effect with a combination of three different variables significant. The seasonal effects indicated by the two versions of the equation are plotted in Fig. 5.3 (on the assumption that $A1 = 0$ $B1 = +3.19$ and $B2 = -1.23$ in the COL version and $A1 = -2.88$ $B1 = +1.93$ and $B2 = 0$ in the WP version). It can be seen that the pattern is basically the same particularly in the first part of the year, the main difference occurring in the final quarter with the WP version suggesting an earlier seasonal weakening of the pound against the franc (October) than the COL version

FIGURE 5.3

ESTIMATED SEASONAL VARIATION IN THE POUND-FRANC
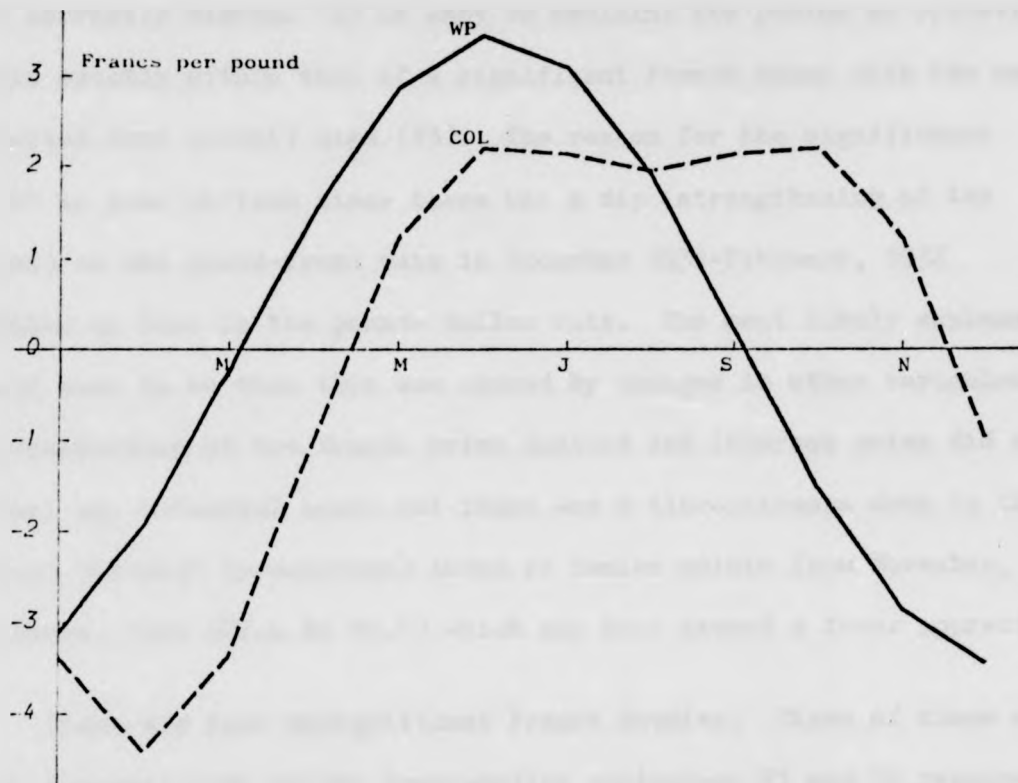
(December). The overall impression is of a weak pound (strong franc) in November-March and strong pound (weak franc) in April-October. There is no particular expectation about seasonal variation in this exchange rate - the crop moving-induced variation of the pound against the dollar applied equally to Britain and Europe - but it could imply that France bought less of these North American goods than Britain. What is perhaps surprising is the larger seasonal variation ($\pm$ 3.9% of the average value of the exchange rate in 1931-8) of the pound-franc rate compared to the pound-dollar rate ($\pm$ 2.4%).

The speculative dummies did not perform as well as they had in the pound-dollar estimates. Nearly half (seven out of sixteen) were insignificant and these are examined first. The insignificance of

K4 was not entirely surprising as it had also failed to show up
in the pound-dollar estimates but K1 and K3 had been significant
and correctly signed. K3 is easy to explain: its period of operation
falls exactly within that of a significant French dummy with the same
expected (and actual) sign (F3). The reason for the significance
of K1 is less obvious since there was a dip (strengthening of the
franc) in the pound-franc rate in December 1931-February, 1932
similar to that in the pound- dollar rate. The most likely explanation
would seem to be that this was caused by changes in other variables.
An examination of the French price indices and interest rates did not
reveal any potential cause but there was a discontinuous drop in the
French "income" (production) index of twelve points from November, 1931
to March, 1932 (82.6 to 70.4) which may have caused a franc appreciation.[72]

There are four insignificant French dummies. Three of these are
also insignificant in the franc-dollar estimates: F1 and F2 represented
potential speculation due to political uncertainties which clearly
seems not to have occurred; the insignificance of F4, which represents
the run on the franc after the Belgian devaluation in 1935, is more
surprising but most probably reflects the existence of official support
of the franc (not picked up by the intervention dummy). The fourth
insignificant French dummy is F12; its performance would suggest
that the collapse of the Blum regime and his replacement by Chautemps
in July, 1937 did restore confidence to some extent.

Of the remaining eight (significant) French speculative dummies
half were correctly signed, half incorrectly. In the former group is
included F5 - the Laval deflation - which had no expected sign but was
positive implying franc weakness; however, it was correctly signed in
the sense that it was also significant with the same implication in the

franc-dollar estimates. The Doumergue ministry (F3) seems to have had the hoped for effect and caused the franc to strengthen[73] whilst the political and financial uncertainties of November, 1935 (F6) and early 1936 (F7) appear to have led to franc weakness. The four significant and wrongly signed variables - F8, F9, F10 and F11 - correspond with the Blum experiment and paradoxically, therefore, they suggest franc strength throughout the period (June, 1936 - June, 1937). In two cases there was some reason to be doubtful of the direction in which the franc would tend (F9 and F11), but it was felt that weakness was the most likely, and F8 and F10 should definitely be associated with weakness. The most plausible explanation (once again) would seem to be the presence of heavy official support for the franc.

It is perhaps instructive to examine the performance of the speculative dummies in Ozmun's study (1976) of the same exchange rate. The dummies here were constructed independently (and from more sources) and so there are important differences but, nevertheless, the major incidents led to the creation of similar dummies in both studies, although the period of operation may differ slightly. Broadly speaking, where similar dummies existed in both studies they performed in a similar manner with two exceptions: the Laval deflation dummy (F5) and the Blum "pause" dummy (F11) which, whilst being positive and negative (respectively) here, were curiously negative and positive in the Ozmun study.

However, Ozmun did find that the performance of a (single) "Blum experiment dummy" covering the June, 1936-February, 1937 period and corresponding to F8, F9 and F10, did unexpectedly indicate a stronger franc although he suggested rather different reasons for this:

> ".....there was in fact a strong "Keynesian" flavour
> to the Popular Front programmes. Measures which
> reduced unemployment and increased consumers' income
> served business and industry as well as the labour
> force. Higher wages could result in higher profits.
> To the extent that the experiments of the Popular
> Front government were viewed in this latter perspective,
> their effect would have resulted in an appreciation of
> the franc". (74)

In addition, two of Ozmun's variables that anticipated franc weakness

and correspond (approximately) with F2 and F12 were insignificant as

they were here. Finally, a variable representing the impact on the

franc of the belga devaluation is significant and correctly signed,

whereas F4 was not; however, Ozmun's variable also incorporates the

November, 1935 capital flight which is picked up by another (significant)

variable (F6) in the present study. In conclusion, the performance of

the speculative dummies in the pound-franc estimates is clearly less

satisfactory than in the pound-dollar estimates, but an important

speculative effect nevertheless emerges, even if it is occasionally

in an unanticipated direction.

The third leg of the pound-dollar-franc triangle was the franc-

dollar exchange rate and the performance of the model in the earlier

estimates were equally satisfactory. In the first stage estimates

there was firm evidence of relative price and relative income effects

and also of ROW effects. The coefficient of determination was high,

as was the Durbin-Watson statistic (greater than two). In addition

there was some indication that official intervention was effective

although it was the found-dollar ID rather than the franc-dollar ID

that was significant; however, when the "wide" version of the latter

variable was replaced by the "narrow" version it did become significant

(and correctly signed). Finally, some seasonal variation seems to have

occurred and numerous speculative dummies were significant though the

trend variable was not. The final versions of dollar-franc equation

are presented in Table 5.6.

TABLE 5.6[1]:   THE DOLLAR-FRANC FINAL ESTIMATES

VARIABLE		COL	WP
Constant		26.6 (7.89)	15.7 (5.71)
French prices/U.S. prices		-5.76 (14.8)	-4.98 (16.8)
U.K. prices		-10.8 (4.46)	-5.16 (4.02)
French income/U.S. income[2]		-2.54 (6.96)	-3.14 (7.77)
U.K. income[3]		-3.89 (1.40)	1.09 (0.40)
French-U.K. interest rates		0.07 (3.06)	0.06 (2.60)
Pound-dollar ID[4]		0.03 (1.04)	0.06 (2.18)
Dollar-franc ID[5]		0.22 (2.12)	0.16 (1.49)
Seasonal Variables:	A1	0.05 (1.35)	-0.09 (2.75)
	B2	0.11 (4.23)	0.11 (4.02)
Trend		0.003(0.62)	-0.005(1.13)
Speculative dummies:	F4	-0.13 (0.92)	-0.11 (0.73)
	F5	-0.19 (2.13)	-0.30 (3.34)
	F9	-0.69 (4.09)	-0.39 (2.30)
	F10	-0.71 (5.60)	-0.29 (1.99)
	F11	-0.61 (5.26)	-0.23 (1.26)
	F12	-1.00 (7.88)	-0.63 (3.67)
	S3	-0.07 (0.63)	0.05 (0.44)
	S4	0.60 (5.26)	0.55 (7.30)
	S5	1.10 (12.7)	0.76 (11.4)
	S6	0.15 (1.26)	-0.03 (0.30)
	S7	-0.45 (2.31)	-0.66 (2.87)
	S9	0.11 (1.22)	0.15 (1.50)
R - SQUARED		0.99	0.99
DURBIN-WATSON STATISTIC		1.77	1.86
STANDARD ERROR OF THE REGRESSION		0.156	0.155
F - STATISTIC		331.8	334.5

Notes: 1.   T-statistics in brackets.
2.   French employment and U.S. employment.
3.   Based on British employment index.
4.   "Wide" version.
5.   "Narrow" version.

The correct signs (negative) and high t-statistics of the relative income and (particularly) relative price variables are immediately apparent although the French-U.S. interest rate differential is excluded as it had been insignificant in the earlier estimates. An increase in ROW prices and possibly also ROW income was associated with an appreciation of the dollar against the franc. There were, however, problems with the latter variable which was significant in only the COL equation and then only at the 20% level. Furthermore, ROW (British) "income" in Table 5.6 is actually based on the British unemployment index as the employment index had been insignificant in the first stage estimates. The French-U.K. interest rate differential is significant (as it was in the pound-franc estimates) and carries a plausible sign implying that a widening of this differential caused the franc to strengthen not only against the pound but also the dollar. It does, however, make the insignificance of the French-U.S. differential puzzling although, since the U.K.-U.S. differential was insignificant in the pound-dollar estimates but the French-U.K. differential was significant in the pound-franc estimates, this may simply imply an inappropriate choice of American interest rate.

Official intervention seems to have influenced the franc-dollar exchange rate both directly and indirectly: the "narrow" franc-dollar ID is significant and correctly signed and the "wide" pound-dollar ID is negative and significant in the WP version implying that support for the dollar against the pound also caused it to strengthen against the franc. The insignificance of the "wide" franc-dollar ID (but significance of the "narrow" version) may imply that only major interventions had a significant effect on this exchange rate. This conclusion is supported by the size of the coefficient on the "narrow"

version which is comparatively large indicating that official intervention led to exchange rate changes of the order of 3.2 - 4.4%. This can be compared to the pound-dollar ID which was associated with changes of (approximately) only 1.1% in the pound-dollar rate (Table 5.4) and 1.2% in franc-dollar rate (Table 5.6).

The trend variable remains insignificant even though a secular decline in the franc against the dollar might have been expected due to increasing fears of war. It may be that the trend variable began too early to capture this effect (since Hitler did not come into power until 1933) or that the influence was an uneven one or that it was mostly felt in 1939 (which is not part of the sample period). There is, however, evidence of a seasonal effect although different combinations of variables are significant in each version of the equation. They are plotted in Fig. 5.4.

The seasonal effect in the COL version is not entirely clear: the same variables (as in the WP version) are significant but, whilst B2 has the same value and sign, A1 has a different value, the opposite sign and is only significant at the 20% level. Therefore two alternative seasonal patterns were plotted in Fig. 5.4 for the COL version, one based on both variables, the other with A1 = 0. In fact, all three potential seasonal patterns are strikingly similar, with identical peaks and troughs in terms of timing, the only difference being the value of the troughs. The main expectation about the seasonal pattern of the franc-dollar exchange rate is that it would probably be similar to that of the pound-dollar rate since European currencies as a whole tended to weaken against the dollar in the autumn and strengthen in the spring. This is precisely what Fig. 5.4 suggests. There was also an unexplained weakening of the franc (strengthening of the dollar) in

FIGURE 5.4

ESTIMATED SEASONAL VARIATION IN THE DOLLAR-FRANC
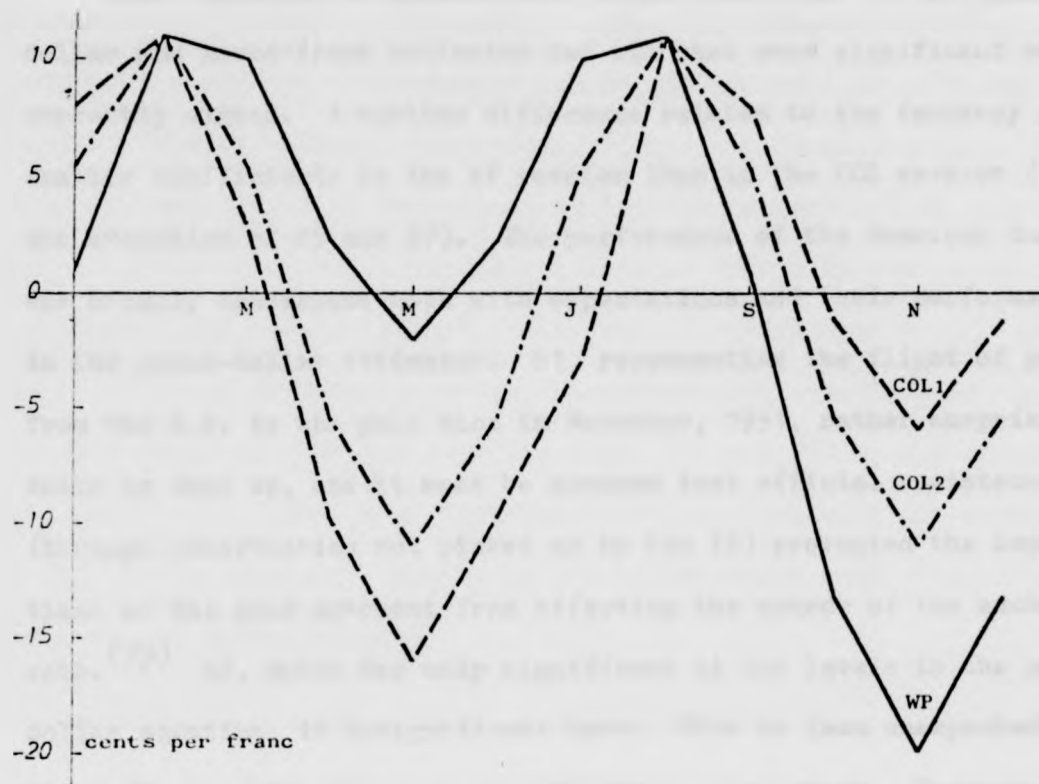
KEY

WP   : A1 = -0.09 , B2 = +0.11.

COL(1): A1 = +0.05 , B2 = +0.11.

COL(2): A1 = 0   , B2 = +0.11.

April-June and strengthening of the franc (weakening of the dollar)
in July-September. This corresponds closely to the pound-dollar
pattern with the dollar tending to strengthen and then weaken in the
April-August period (Fig. 5.2). Furthermore the size of the seasonal
variation in the franc-dollar rate ($\pm$ 2.2% - $\pm$ 3.2%) is of a similar

order to that of the pound-dollar rate ($\pm$ 2.4%) and to a lesser
extent that of the pound-franc rate ($\pm$ 3.9%).

Fewer speculative dummies were significant than in the pound-
dollar and pound-franc estimates but all that were significant were
correctly signed. A further difference relates to the tendency for
smaller coefficients in the WP version than in the COL version (with
the exception of F5 and S7). The performance of the American dummies
was broadly consistent both with expectations and their performance
in the pound-dollar estimates. S1, representing the flight of gold
from the U.S. to the gold bloc in November, 1931, rather surprisingly
fails to show up, and it must be assumed that official resistence
(through intervention not picked up by the ID) prevented the implica-
tions of the gold movement from affecting the course of the exchange
rate.[75] S2, which was only significant at low levels in the pound-
dollar equation, is insignificant here. This is less unexpected than
the failure of S3 which was significant in the latter. However, the
interregnum period (between Roosevelt's election and taking office)
was one of conflicting influences, and it may be that, as far as the
franc-dollar exchange rate is concerned, they cancelled each other
out.

S4 and S5 represent the 1933-34 period of dollar undervaluation
and perform as expected indicating that the undervaluation was greater
in 1934 (following the U.S. gold buying policy) than in 1933. They
further suggest, in conjunction with earlier results, that the under-
valuation was greater vis-a-vis the franc than the pound,[76] which
is perfectly consistent with historical fact since any undervaluation
of the dollar might have been expected to be compounded by the over-
valuation of the franc in this period. It was anticipated that S6

would be associated with dollar strength due to the uncertainties
caused by the impending gold clause judgement in early 1935, but it
was, in fact, significant and wrongly signed in the pound-dollar
estimates indicating dollar weakness; this was interpreted as
suggesting a continued undervaluation of the dollar into 1935 and
it may have been that in the determination of the franc-dollar
exchange rate these two offsetting influences cancelled each other
out thereby causing S6 to be insignificant. S7 and S9 are correctly
signed and significant (albeit the latter at rather low levels) and,
although S8 was excluded, because it corresponded exactly with two
French dummies of the same expected sign (F10 and F11) their signifi-
cance may be at least partly attributed to the influence represented
by S8. S10 is insignificant as it was in the final estimates of the
pound-dollar exchange rate.

The significant French speculative dummies are all correctly
signed but there is some conflict with their performance in the pound-
franc estimates where this was not the case. F1, F2 and F4 were
insignificant in the estimates of both exchange rates. Four variables -
F3, F6, F7 and F8 - which were significant in the pound-franc estimates
were not significant here. This is a little surprising but it may
reflect a tendency for events in France to have more impact (in
terms of effects in confidence) in Europe than in America although
this contention is somewhat undermined by the significance of F12
which was insignificant in the pound-franc estimates. However, this
is not necessarily the case since the "Blum experiment" (and the
dummies associated with it) do seem to be a plausible exception to
the suggested rule that incidents in France may have influenced
European opinion more strongly. Another exception is the Laval

deflation (F5) which seems to have created equal pessimism about the franc on both sides of the Atlantic.

The four "Blum dummies" (F8, F9, F10 and F11) were significant and wrongly signed in the pound-franc estimates but in the dollar-franc estimates three of them are significant and correctly signed. At first sight, therefore, the "Blum experiment" seems paradoxically to have caused the franc to strengthen against the pound but weaken against the dollar. This is not an impossible scenario but would seem an unlikely one; fortunately, a more plausible alternative explanation is available when the four variables are examined individually. F8 is insignificant and there is no conflict whilst F9, F10 and F11 correspond virtually exactly with American speculative dummies which represent periods of expected dollar strength. This is particularly true of F10 and F11 which correspond exactly with S8 which was significant and correctly signed in the pound-dollar estimates but was excluded here (to avoid multicollinearity). Consequently an alternative interpretation of F10 and F11 would be that they indicate the importance of American rather than French influence in the shape of a significant and correctly signed S8. This is strongly supported by the similarity of the actual coefficients of F10 and F11. Thus there is a case for arguing that the "Blum experiment" variables are picking up American and not French influences and therefore there is no conflict between the results in the pound-franc and pound-dollar estimates.[77]

In conclusion, it is clear that the performance of the speculative dummies and indeed, the general performance of the two versions of the franc-dollar exchange rate, are highly supportive of the main hypotheses incorporated in the model; in particular, there is strong evidence of

the expected relative price and relative income effects. However, before deriving some general conclusions about the pound-dollar-franc triangle three outstanding issues have to be dealt with: firstly, the possibility of replacing the speculative dummies by a "blanket" proxy for speculation based on forward exchange market data has yet to be empirically explored; secondly, since many of the variables (most obviously the speculative dummies) appear in more than one equation, an explicit examination of the consistency of their performance would seem appropriate - for example, if the same variable was associated with sterling appreciation against the dollar but depreciation against the franc then this would require explanation; finally, the possibility of positive serial correlation has to be addressed since the Durbin-Watson statistics are persistently in the indeterminate range.[78] These issues are discussed in the next section.

(IV)

In the discussion of how to empirically approximate the existence of speculation (in chapter four) a variety of possibilities were discussed. Ultimately it was decided to try one variant of each of the "generic" types of method that were identified: a measure aimed at picking up the potential speculation induced by specific incidents (dummy variables) and a "blanket" measure (based on forward market data). The former was preferred for a number of reasons, most importantly the fact that "blanket" measures may pick up non-speculative influences and, at the practical level, the lack of suitable data from which to construct "blanket" measures; in fact, for this latter reason - lack of readily accessible forward market data - the "blanket" measure

used here could only be tried for exchange rates involving the
pound.

Thus a series of regressions were run for the pound-dollar
and pound-franc exchange rates in which the speculative dummies were
dropped and replaced by an SV (speculative variable) which consisted
of the average three month forward exchange rate adjusted by the
three month interest rate differential.[79] Speculation is thereby
incorporated on the basis of the assumption that when there was an
adjusted forward discount (premium) on a currency, speculators were
expecting it to depreciate (appreciate) and capital was therefore
flowing out of (into) the country in question in anticipation, causing
the spot rate to weaken (strengthen). In both the pound-dollar and
pound-franc equations the SV is constructed in such a way as to be
expected to have a negative sign.

In the pound-franc equations it did indeed have a negative
sign but was only significant at very low levels (20 per cent). In
addition the two equations' performances were considerably worsened
in terms of higher standard errors of the regression and (slightly)
lower R-squareds and F-statistics. Furthermore, the Durbin-Watson
statistic became very low indicating the presence of serial correla-
tion. Insofar as this could be taken as evidence of omitted variables
(which is a possible cause of serial correlation), one of which could
be the presence of speculative capital flows inadequately proxied
by the SV, it could be interpreted as suggesting that the SV picked
up less of the speculative influence than the speculative dummies
and so the latter are a better way of modelling speculation in practice
(as well as in theory).

The SV in the pound-dollar estimates was highly significant but incorrectly signed. Offsetting official intervention, not picked up by the ID, might have caused insignificance but a positive sign is difficult to interpret. The explanation is most probably to be found in two sources: the variable may be based on inadequate data or it may not be a suitable proxy for speculation (or both). Concerning the former possibility, the choice of interest rates may have created some distortion; the U.K.-U.S. interest rate differential was insignificant and it has been suggested that the interest rates chosen may be inappropriate. With regard to the latter possibility, it is conceivable that the assumption that speculators dominated the forward market does not hold[80] and therefore speculators were (for some reason) reacting against the expectations embodied in the forward rate or, more fundamentally, the SV was picking up something other than speculative capital flows. Perhaps some solace can be drawn from the observation that generally, in terms of R-squared, the Durbin-Watson and F-statistic and the standard error of the regression the pound-dollar equation performs better if speculative dummies are used rather than SV's. As this is even more clearly the case in the pound-franc estimates the use of speculative dummies in the final equations seems justified.

Use of speculative dummies introduces the question of consistency: do, for example, British speculative dummies perform in a consistent (or at least non-contradictory) way in the pound-dollar and pound-franc estimates? This question is also relevant for the French and American speculative dummies and also for some of the "economic fundamental" variables. The performance of the relevant variables is summarized in Tables 5.7 and 5.8. The expected signs

of the variables are also given in Table 5.7 although, in the
present discussion, emphasis is placed mainly on consistency of
performance rather than plausibility (since this has already been
dealt with at some length above).

There are twenty six speculative dummies in Table 5.7. Four
of these are significant and correctly signed in both exchange rates
to which they are applicable whilst a further eleven are significant
in one but not in the other, giving a total of fifteen dummy variables
(58%) that are significant and correctly signed for at least one
exchange rate. The former are clearly performing in a perfectly
consistent manner whilst the latter are not actually behaving incon-
sistently. A reasonable explanation would be that significance in one
exchange rate but not the other suggests, on the one hand, that events
which had effects on foreign confidence did not influence opinion
equally strongly in all foreign countries and, on the other, that
domestically owned capital did not necessarily flow out to (or return
from) all foreign countries in equal proportions when political factors
were causing such capital to move; both of these possibilities are quite
plausible.[81]

Of the other eleven dummy variables three are significant and
"wrongly" signed in one or both exchange rates and, to the extent
that adequate explanations were found for these "wrong" signs, there
is no inconsistency here. Nor is there any in the performance of the
five dummies that were always insignificant; clearly, the events that
these variables represented did not have the effect on capital flows
that might have plausibly been expected. This leaves three final
variables - F9, F10 and F11 - which are significant and suggest a
strong franc against the pound but a weak franc against the dollar,

TABLE 5.7: SUMMARY OF THE PERFORMANCE OF
THE SPECULATIVE DUMMIES

		POUND-DOLLAR	POUND-FRANC	FRANC-DOLLAR
POUND EXPECTED TO:				
K1 Dec. 31-Feb. 32	D	D	X	
K2 Jan.-Feb. 33	A	X	A	
K3 May-Aug. 34	D	D	X	
K4 Mar. 35	D	X	X	
DOLLAR EXPECTED TO:				
S1 Oct. 31	D	NI		X
S2 Apr.-May 32	D	D*		X
S3 Nov. 32-Feb. 33	D	A		X
S4 Apr.-Oct. 33	D	D		D
S5 Nov. 33-Dec. 34	D	D		D
S6 Jan.-Apr. 35	A	D		D*
S7 Oct.-Nov. 36	A	X		A
S8 Jan.-June 37	A	A		NI
S9 Oct. 37-July 38	D	D		D*
S10 Aug.-Dec. 38	A	A*		X
FRANC EXPECTED TO:				
F1 Nov.-Dec. 32	D		X	X
F2 Nov.-Dec. 33	D		X	X
F3 Mar.-Oct. 34	A		A	X
F4 Apr.-May 35	D		X	X
F5 June-Oct. 35	?		D	D
F6 Nov. 35	D		D	X
F7 Jan.-Mar. 36	D		D*	X
F8 June-Sept. 36	D		A	X
F9 Oct.-Dec. 36	?		A*	D
F10 Jan.-Feb. 37	D		A	D
F11 Mar.-June 37	?		A	D
F12 July-Oct. 37	D		X	D

Key: A = Appreciate, D = Depreciate, X = Insignificant, NI = not
included for this exchange rate, * = only significant at low
levels or in one variant (WP or COL) of the equation.

thereby behaving in an apparently inconsistent manner. However, a close examination reveals (as already indicated in the discussion of the dollar-franc estimates) that this inconsistency is more apparent than real since all three variables correspond either exactly (F10 and F11 with S8) or almost exactly (F9 with S7) with American dummies associated with dollar strength. Hence F9, F10 and F11 are really picking up (expected) American effects in the dollar-franc estimates. Thus there is no inconsistency in the performance of these (or any other) speculative dummy variables.

The performance of the "economic fundamental" variables which might be expected to behave in a consistent manner across the three exchange rates is summarized in Table 5.8. Although one variable - the pound-franc ID - carries a curious sign in the pound-dollar estimates, there is no actual inconsistency at all in Table 5.8. Only one interest rate differential is significant; this is the U.K.-French differential which implies that a rise (fall) in French interest rates caused the franc to appreciate (depreciate) against both the pound and the dollar. There is no inconsistency but, at first sight, the significance of this variable and not the U.S.-French differential in the franc-dollar estimates seems rather strange. However, no differential which involved the U.S. interest rate (not even the U.K.-U.S. differential in the pound-dollar estimates) was ever significant and this has been put down elsewhere in the chapter to an inappropriate choice of U.S. interest rate and Table 5.8 would seem to support this conclusion. Only one intervention dummy was significant in two equations: this was the pound-dollar ID and its positive sign in both the pound-dollar and franc-dollar equations indicated that attempts to support the dollar against the pound were not only successful in doing just that but had

TABLE 5.8: A SUMMARY OF THE PERFORMANCE OF "ECONOMIC FUNDAMENTALS"

APPEARING IN THE ESTIMATES OF MORE THAN ONE EXCHANGE RATE

	POUND-DOLLAR		POUND-FRANC		DOLLAR-FRANC	
An increase in this variable is associated with:-	POUND	DOLLAR	POUND	FRANC	DOLLAR	FRANC
U.K.-U.S. interest rate differential	X	X	X	X	X	X
U.K.-French interest rate differential	X	X	D	A	D	A
U.S.-French " " "	X	X	X	X	X	X
Trend variable	A	D	A	D	X	X
A positive value of this variable is associated with:-						
Pound-dollar intervention dummy (wide)	A	D	X	X	D	A
" " " " (narrow)	NT	NT	NT	NT	NT	NT
Pound -franc " " (wide)	D	A	X	X	X	X
" " " " (narrow)	NT	NT	X	X	NT	NT
Dollar-franc " " (wide)	X	X	X	X	X	X
" " " " (narrow)	NT	NT	NT	NT	D	A

KEY: A = Appreciate, D = Depreciate, X = Insignificant, NT = not tried.

the side effect of causing the dollar to appreciate against the
franc also (which seems quite plausible). The trend variable
indicated a tendency for the pound to appreciate against both the
dollar and the franc throughout the 1930's.

The third outstanding issue relates to the fact that in all
the equations presented above, the Durbin-Watson statistic is in the
inconclusive range, albeit towards the top of it in most cases. How-
ever, the suspicion of positive serial correlation nevertheless exists
and must be faced. In many ways this is not surprising as an obvious
a priori reason for it exists in the form of omitted variables,
particularly trade controls, but also additional speculative or "non-
economic" influences; in this latter connection low Durbin-Watson
statistics might be interpreted as suggesting that speculative
influences had a greater role in exchange rate determination than is
indicated by the speculative dummies. There are various ways of in-
vestigating the possibility of serial correlation and two avenues are
explored here: firstly, it seemed reasonable to re-estimate the final
equations[82] using the Cochrane-Orcutt (CORC) technique[83] since
this option was available as part of the computer package that was
being used; secondly, and in some ways preferably, given that the
Durbin-Watson statistic is really only a summary measure, is to examine
the residuals of the OLSQ final equations (presented above). Doing
this would also give some indication of exactly when excluded variables
were important and, to the extent that their effects took the form of
speculative capital flows, when dummy variables should have been
included. The CORC estimates are described first.

Using the CORC technique did slightly "improve" the equations
in terms of lower standard errors of the regression, higher R-squareds

and higher Durbin-Watson statistics (for two of the exchange rates)
but, on balance, any other changes were inconsequential, and so the
results are not presented in detail and only the changes are discussed.
The most affected exchange rate was the pound-dollar: the relative
price and income variables became significant in one less equation,
leaving relative incomes significant in two out of three versions
and relative prices in only one, although this was the WG version,
arguably the most severe test of the PPP hypothesis, whilst ROW
prices and incomes became insignificant in all three variants and
the level of significance of the pound-dollar ID (insofar as it could
still be called significant) dropped to 30 per cent; on the other hand,
the awkwardly signed pound-franc ID is not even significant at this
low level, half the previously significant speculative dummies are
no longer significant and the U.K.-U.S. interest differential is now
significant (and correctly signed) in all three versions.

Whether or not the CORC estimates actually provide any less
support for the central hypothesis of "stable" exchange rates is
therefore debateable. Furthermore some general doubts about the CORC
estimates are created because of the change in sign (yet continued
significance) of $S4$ which now indicates that the dollar was over-
valued in April-October, 1933 by some 20 cents. Not only does this
run counter to the OLSQ and CORC estimates of the dollar-franc which
indicate a substantial dollar undervaluation but it would seem to
conflict with historical fact. Therefore, even if it were judged
that there is a slight unfavourable balance in support for the model
involved in switching from an OLSQ to CORC estimation technique, this
should perhaps not be taken too seriously.

This is especially true given that the balance of support for

the model is higher in the CORC estimates of the pound-franc
exchange rate. To the fact that half the speculative variables
become insignificant, as for the pound-dollar, can be added the
insignificance of the previously significant and wrongly signed
relative income variable and the observation that the reinstated
pound-franc ID is significant (at the 10 per cent level) and correctly
signed. Finally as rho is insignificant in both WP and COL equations,
the OLSQ and CORC estimates of the franc-dollar exchange rate are,
not surprisingly, virtually identical. Thus the CORC estimates do
not really shed any further light on the main hypothesis of the study
although they would not appear to undermine the OLSQ results.

An examination of the residuals, as already indicated, is likely
to be more useful to the extent that it suggests exactly when important
variables were being excluded (assuming that this is a plausible reason
for any serial correlation). Obviously there is an initial difficulty
in that no rules exist for interpreting residuals: how large does a
residual have to be to merit consideration and how many consecutive
residuals of the same sign constitute a significant cluster?[84] The
procedure adopted here was to look for months in which the residuals
were larger than one standard error of the regression in one of the
variants and, unless the residual in the other variant(s) was very
small or carried the opposite sign, to examine these plus any adjoining
months in which the residuals of all variants carried the same sign.
This rule, however, was not rigidly applied and sustained periods in
which the residuals carried the same sign but remained smaller than
one standard error were also considered. Such an approach should
take in all periods of potential interest and all the periods identi-
fied by this "rule" are given in Table 5.9.

TABLE 5.9[(1)]: SUMMARY OF LARGE RESIDUALS IN THE

ESTIMATES OF THE POUND-DOLLAR-FRANC TRIANGLE

	POUND-DOLLAR	POUND-FRANC	DOLLAR-FRANC
1931			Nov. +
1932		Jan. Feb. } + MAR. APR. May) June July AUG. -	JAN. Feb. -
	Sept. OCT. -		Sept. Oct. -
1933	APR. -		APR. -
	JULY +		JULY +
			AUG. -
	Sept. Oct.) NOV. DEC. } + Jan.)		NOV. Dec. } + JAN. FEB. Mar)
1934		Jan. FEB. -	May JUNE July -
	SEPT. Oct. } - Nov. DEC.)	Nov. Dec. -	Nov. DEC. -
1935	JAN. +		
	MAY June July) Aug. Sept. Oct. NOV.) + Dec.)	DEC. } + Jan.)	
1936		JUNE +	
			JULY Aug. +
		SEPT. -	
		OCT. +	OCT. -
			NOV. +
		DEC. -	
1937			NOV. Dec. -
1938	Mar. Apr. } + May June)	May June) July } + Aug.)	
	AUG. } + Sept. Oct.)		Aug. } - SEPT. OCT.) Nov. Dec. +

Note (1) Months in block capitals are those in which the residual was
larger than one standard error in all variants of the exchange
rate final estimates.

It has been implied that large residuals probably represent omitted variables and therefore can be explained by examining what was happening in foreign exchange markets and specifically looking for potential reasons for speculation; this is the approach of Hudgins (1973) who does not use dummy variables. Unfortunately, in the present study it is likely to be difficult to identify reasons for large residuals because all the plausible reasons have been "used up" to derive dummies already incorporated into the model. However, there are several other possibilities: firstly, information on the effects of protection and all official intervention was not available and therefore either of these two influences may explain large residuals; secondly, dummy variables of constant value are "blanket" measures which ignore the possibility of differing intensity over time of the effects they are seeking to capture. Finally, an alternative interpretation is that serial correlation is not indicative of excluded variables but rather suggests a misspecification of the dynamics of the model; whilst this is a simple model with no dynamics as such, the possibility of such a misspecification still exists if it is interpreted in terms of whether or not the timing of the dummies in the model is correct. It would therefore be instructive to examine whether periods of large residuals are adjacent to periods covered by dummy variables to look for "mistiming".

It is not proposed to examine the residuals on an individual exchange rate basis since any excluded variable that affected, for example, the pound would presumably cause residuals in both the pound-dollar and pound- franc estimates. Therefore it is more appropriate to examine the residuals of all three exchange rates at the same time. In fact, the single large residual in 1931 only actually involved one

exchange rate and occurred in the dollar-franc estimates in
November, indicating a weaker dollar than predicted by the model.
The explanation for this would seem to be straightforward and lie
in a mistiming of S1 which covers October, 1931 and was insignificant;
hence the main impact of the outflow of gold from the U.S. to France
on the exchange rate appears to have been felt in November, not
October as originally postulated.[85]

Mistiming of a dummy variable - S3 (November, 1932 - March, 1933) -
would also seem likely to explain the September-October, 1932 residuals,
indicating unexplained dollar strength, in both the pound-dollar and
dollar-franc estimates. S3 was expected to be associated with dollar
weakness, but in the pound-dollar estimates it was significant and
"wrongly" singed. However, this sign was not entirely implausible
and hence the mistiming argument used here is not inconsistent with
the originally expected sign of S3. The January-May, 1932 positive
residuals in the pound-franc estimates are probably explained by the
pound's recovery in early 1932; in particular, the large residual in
March is indicative of this, given that this is when the "most
sensational developments"[86] took place. The sudden drop in the
pound in November, 1931 and its recovery in early 1932 had been modelled,
in dummy variable terms, by treating the November, 1931 - February, 1932
period as one in which the pound was artificially weak rather than
treating the March-April, 1933 period as one of exceptional sterling
strength. This seems to have been appropriate for the pound-dollar
exchange rate (since K1 is significant) but the experience of the
pound in its fluctuations against the franc appear to have been
slightly different.

The other two sets of large residuals in 1932 are less easy to

explain: the June-August residuals in the pound-franc equation
suggest sterling weakness and these months did witness a gradual
depreciation of the pound against the franc which may indicate some
reaction to the sterling strength in the first half of the year and
possibly that the pound had reached an artificially high level;
alternatively, this may represent official British intervention,
aimed at pushing the pound down, carried out by the EEA in the first
few months of its existence. The January-February residuals in the
dollar-franc equation suggest dollar strength which could also indicate
undetected official intervention in the form of support for the dollar,
still tending towards weakness in early 1932, although this is
admittedly fairly tenuous.

In 1933 large residuals only occur in the two dollar exchange
rates and are therefore clearly related to the U.S. abandonment of
the gold standard in March. This period represented an artificial
undervaluation of the dollar but the actual downward movement was an
uneven one and the large residuals almost certainly reflect the inad-
equacy of using a dummy variable with a constant value to take account
of this. The large April negative residuals indicate a strong dollar
but the dummy variable (S4) gives the average level of undervaluation
in the April-October, 1933 period and the dollar did not depreciate
substantially until May. There was a sudden (and large) depreciation
in July which the "averaging dummy" must inevitably understate, thereby
explaining the large positive residuals in this month. Finally the
downward trend in the dollar temporarily reversed itself in August
which accounts for the large negative residual in the dollar-franc
estimates. (There are also negative residuals in all three versions
of the pound-dollar equation in August but they are all less than one
standard error and therefore do not appear in Table 5.9).

The positive residuals in both dollar exchange rates at the
end of 1933 and going into the beginning of 1934 can also probably
be explained in terms of the inadequacy of a constant value dummy.
In this case it is the fact that S5 (November, 1933 - December, 1934)
cannot fully allow for the rapid depreciation at the end of 1933 whilst
simultaneously allowing for the levelling off of the dollar in 1934.
Hence, in the November, 1933 - March, 1934 period S5 only picks up
part of the effect thereby leaving positive residuals, suggesting
unexplained dollar weakness. The negative residuals at the end of
1934 are a symptom of the same problem: just as S5, in "averaging out"
the undervaluation of the dollar in November, 1933 - December, 1934 ,
underestimates the degree of dollar undervaluation in the first part
of the period, so it seems to overestimate it at the end, leading to
negative residuals (suggesting dollar strength).

The two sets of residuals in the pound-franc estimates in 1934
obviously require a different explanation. The reason why there
should be unexplained franc strength in January-February, 1934
(negative residuals) is not immediately clear. On the one hand, it
does precede a dummy variable designed to pick up franc strength
(March-October, 1934) so the mistiming of dummies may be a possibility
but, on the other hand, this is rendered unlikely because these residuals
immediately follow a period of alleged franc weakness in November-
December, 1933 (F2). A more likely explanation is that the franc
was receiving official support in early, 1934. There are two good
reasons to believe this: firstly, F2 is not significant, possibly
indicating official support in late 1933, and secondly, a contemporary
source reports that the Bank of France was buying francs in January,
1934.[87] However, the suggestion that the November-December, 1934

residuals, also indicating franc strength, are due to a mistiming (or rather a continued applicability) of F3 is quite plausible.

In 1935, the large residuals are mainly in the pound-dollar estimates. The January residual (dollar weakness) could indicate another averaging problem since the sign and significance of S6 (January-April, 1935) suggests that the 1933-4 undervaluation of the dollar continued into 1935 and it may be that January is more properly considered as part of the period covered by the preceding dummy variable (S5).[88] The May-December residuals, indicating further dollar weakness, are difficult to explain but could be interpreted as evidence that the dollar remained undervalued during the whole of 1935. The other residual in 1935 - December in the pound-franc - which carries over into January, 1936 could plausibly be interpreted as mistiming of (or rather a continuation of the effects of) F6 and F7, both of which are significant.

Just as the residuals in 1933 were all related to the dollar depreciation, so all the 1936 residuals appear to be related to the franc devaluation since they all occur in franc exchange rates. The June residual indicates unexplained franc weakness and could be due to a combination of the averaging implicit in the significance of F8 covering June-September (which indicated franc strength) and the fact that in June, the first month of the Blum administration, the franc was particularly weak.[89] The September residual in the pound-franc equation could be interpreted as representing the very strong support for the franc required in its last month at its old value. Such support did occur[90] and is represented in the pound-franc ID but this variable does not differentiate between strong and weak levels of intervention. Official support for the franc may also explain the positive July-August

residuals in the dollar-franc estimates especially since, although
F8 was insignificant, it was positive (indicating a stronger franc).

The October and December residuals in the pound-franc equation
are arguably due (once again) to the inability of dummy variables
to pick up uneven effects. F9 (October-December) is insignificant
in the COL version and significant (strong franc) in the WP version.
The positive residual in October and negative residual in December
would suggest that the forces causing the franc strength, being
picked up by F9, gradually became stronger in this three month
period and F9 seems to have gone through the middle of the period
(November) averaging out the effect, thereby overstating the degree
of franc strength in October and underestimating it in December. A
similar problem seems to have occurred in the dollar-franc estimates
in the same period, only in this case there are two significant dummies
concerned - F9 (October-December) and S7 (October-November).[91]

The negative residuals in November-December, 1937 in the dollar-
franc show unexplained franc strength (dollar weakness). One possible
interpretation would be mistiming (or rather continuation) of the final
three French speculative dummies - F10, F11 and F12 - which were all
significant, indicating sustained franc weakness throughout the first
ten months of 1937. However, this is doubtful given that the franc
apparently recovered at the end of 1937.[92] A more plausible
explanation may relate to the unevenness of the effect picked up
by S9 (October, 1937 - July, 1938), a period of dollar weakness;
this would suggest that the weakness of the dollar was more pronounced
in the later part of this ten month period than in the earlier part.
Such an explanation is consistent with the March-June, 1938 positive
residuals in the pound-dollar estimates also being interpreted as

indicative of the unevenness of the effect picked up by S9, since
the sign of the residuals would suggest greater dollar weakness
in the latter part of the period covered by S9.

The other three sets of residuals involving the dollar in
1938 would all seem to be related to the reported flight of capital
from Europe to America in autumn, 1938 and hence S10, which aims to
pick up the associated dollar strength. S10 is insignificant in the
dollar-franc estimates and the August-December residuals show why:
it seems a fairly clear case of mistiming with S10, covering the
whole of this period, insignificant because the dollar apparently
strengthened in the first three months (especially September and
October) and the franc recovered slightly at the end of the year.
The August-October residuals in the pound-dollar also overlap with
S10 which was insignificant in the final estimates. The positive
sign of these residuals (sterling strength) may show why: their sign
would indicate that there was some pressure on the pound to appreciate,
possibly in the shape of official intervention to support the pound
(which was certainly taking place at this time). Finally, the May-
August residuals in the pound-franc estimates probably represent an
undervaluation of the franc in this period in the sense that it was
deliberately depreciated by Daladier in May, 1938.[93] This action
possibly required a dummy variable in the first place.

Thus it would seem that there are plausible explanations for
the majority of the large residuals in the estimates of the pound-
dollar-franc triangle. These explanations relate principally to
mistiming of dummy variables, undetected official intervention and
the inability of dummies with a constant value (unity) to adequately
pick up speculative influences of varying intensity. To this list

might be added the distortions created by tariffs and import
controls whose effects, by their very nature, are impossible to
quantify and difficult to work out even in general terms (let alone
in terms of explanations for specific residuals) and are therefore
not used. It is also likely that a variety of minor speculative
effects took place which it has not been possible to detect even from
contemporary sources.

(V)

At this stage, it might be suggested that, having obtained
these results, it would be appropriate to re-estimate modified
versions of the final equations, perhaps using new speculative
dummies derived from the analysis of the residuals. However, this
is resisted for a number of reasons. Firstly, a certain amount of
"experimentation" has already been carried out in various ways, most
obviously the use of different income proxies and "narrow" and "wide"
versions of the ID's in some equations. Secondly, such a procedure
is, in some ways, rather dubious: economic models should be developed
on the basis of economic theory not empirical results. Finally, and
perhaps most important, a halt has to be called somewhere and, to the
extent that the basic model "explains" exchange rates and that the
large residuals have been satisfactorily accounted for, a modified
version of the model is unlikely to shed any further light on the
hypotheses being tested.

However, before drawing some preliminary conclusions a few
words should be said about a theoretical matter, raised in chapter two,
relating to the fact that in any exchange rate triangle to estimate

all three exchange rates involves, in a sense, one estimation too
many, in that once two of the exchange rates have been estimated
so has the third (implicitly) and its predicted value can be
calculated through cross-rates. A number of arguments were
advanced at that point, to suggest that the third exchange rate
ought to be estimated anyway but it was also indicated that it might
be interesting to examine the difference between the predicted direct
rate and the predicted cross-rate for each of the three exchange
rates in the major exchange triangle, and it was suggested that any
large inconsistencies would merit some comment. Before doing this
it seemed reasonable to make an adjustment for any differences
between the actual direct and actual cross-rates; in fact, these
turned out to be very slight (as would be expected) and so the
adjustment was a minor one.

The results of this exercise were rather surprising: for all
three exchange rates there were frequent and occasionally large
differences. For the pound-dollar rate 55% of the observations have
a difference between the predicted direct and cross-rates which is
greater than one standard error of the regression of the final equation
(and 30% are greater than two standard errors). The comparable figure
for the other two exchange rates are less discouraging - 30% (10%) for
the pound-franc and 40% (15%) for the dollar-franc[94] - but never-
theless quite large, sufficiently so to require some explanation.

This may be found by observing that there are, in fact, three
conditions for the predicted direct and predicted cross-rates to be
identical and that these may not have been fulfilled. Firstly, there
should be no differences between the actual direct and cross-rates
but this cannot be used as an explanation here because an adjustment

has been made to allow for it. Secondly, there must be a linear

relationship between the dependent and independent variables in

the equations for all three exchange rates; this has obviously been

assumed to be the case in the estimations and therefore cannot be used

as an explanation either. Thirdly, the independent variables should

be the same in all three equations. This can be used as it is clearly

not the case and no adjustment has been made to make allowance for it.

Even in the initial estimates (with all relevant variables included)

this was not the case: although the "economic fundamental" variables

of all three countries are included in each exchange rate this is

not true of the speculative dummies; thus, for example, the pound-

dollar estimates include British and American but not French dummies

and so on. In the final estimates the differences in the independent

variables in the three equations are even greater because the in-

significant variables omitted differ for the three exchange rates.

Thus this may to a large extent explain the differences between the

predicted direct and predicted cross-rates.

Nevertheless, these differences may be interpreted as providing

some evidence to suggest that some important influences have been

excluded from the model, probably relating to the effects of

(unidentified) speculation and the high level of protection. On

the other hand, however, it may be argued, with some justification

given the lack of fulfilment of the third condition listed above,

that to expect accurate predictions of cross-rates is a very severe

test of the model and, an optimistic way of interpreting the above

results would be to conclude that, not only does the model seem to

largely determine movements in directly observed exchange rates, but

it also "explains" what determines cross-rates (to within two standard

errors of their predicted direct values) for approximately four-fifths
of the time.

To conclude then, the performance of the model in explaining
the movements within the pound-dollar-franc triangle is, on the whole,
good enough to generate a fair measure of support for most of the
hypotheses embodied within it. There is substantial evidence to suggest
that the major exchange rates were not exclusively determined by specu-
lative factors but that the underlying "economic fundamental" influences
were of great importance and, to that extent, these exchange rates were
more "stable" than is commonly supposed.

Furthermore, where speculation was apparently important (in the
shape of significant speculative dummies) it was not always entirely
clear that it was "destabilising". In a situation where speculation
(as represented by the dummy variables) is based on "correct" expectations
about changes in "economic fundamentals" then it is stabilising rather
than destabilising (although possibly still inconvenient from the
government's point of view). Speculation can only really be described
as destabilising either where there is some extrapolation of such
expectations causing the exchange rate to fluctuate excessively or
where it is based on reaction to non-economic fundamentals - for
example, to political events - which should not influence the exchange
rate. This difficulty of interpretation is present in the other tests
of the model and is taken up again in the conclusions of this section.

In the next two chapters the model is tested for exchange rates
involving four minor currencies and, on the basis of the results of
these tests and of those in the present chapter, some conclusions
will be drawn about bilateral exchange rates in the 1930's in general.

FOOTNOTES TO CHAPTER 5

1. This is not strictly true of the franc which was on the gold standard and had no currencies explicitly pegged to it. However, the ability of other countries to remain on the gold standard crucially depended on France staying on gold and, as soon as France left gold and devalued, the remaining gold bloc countries (Switzerland and Holland) were compelled to do the same (against their will). Hence the currencies of such countries were, in a sense, "pegged" to the franc.

2. The classic reference is Keynes' "The Economic Consequences of Mr. Churchill" (1925) and the majority of subsequent writers have concurred with Keynes' view that Britain did not adopt a wise course of action.

3. See D.E. Moggridge's "The Return to Gold, 1925" (1969) and also his "British Monetary Policy, 1924-31" (1972).

4. Lloyds Bank Review, Jan., 1932, p. 20.

5. Economist, 9/7/32, p. 57.

6. Economist, 12/3/32, p. 559.

7. The Economist did report some speculation in an article entitled "The Fall in Sterling" in October (29/10/32, p. 774) but argued that the fall was mainly seasonal and therefore a dummy variable is not justified.

8. Economist, 18/2/33, p. 334.

9. Ibid, p. 339.

10. At the same time as the spot pound was weakening, Continental purchases of pounds in the forward market, in anticipation of a later seasonal appreciation, caused the forward pound to strengthen. (Economist, 23/9/33, p. 566.)

11. Economist, 16/9/33, p. 524 and 30/9/33, p. 612.

12. Economist, 5/1/35, p. 18.

13. Economist, 26/5/34, p. 1145.

14. Lloyds Bank Review, June, 1934, p. 264.

15. See the Economist, 26/5/34, p. 1145 and 14/7/34, pp. 68-9 for a more detailed list of potential causes of the weakness of the pound.

16. Economist, 9/3/35, p. 520.

17. Economist, 2/3/35, p. 479. See also Lloyds Bank Review, March, 1935, pp. 165-6.

18. Economist Commercial History Review of 1937 (12/2/38) p. 8.

19. Economist, 10/9/38, p. 504.

20. Economist, 10/10/31, p. 656.

21. Ibid, p. 646.

22. Ibid, p. 647.

23. However, it will not be included in the pound-dollar regressions as any tendency of the dollar to weaken was mainly in relation to the Continental currencies and, more importantly, the depreciation of the pound in 1931 would clearly swamp any dollar weakness as far as the pound-dollar exchange rate was concerned.

24. See the Economist 13/1/34, p. 70, Yeager (1976), p. 350 and Lloyds Bank Review, March, 1933, p. 106.

25. See, for example, Hodson (1938), p. 227, the Statist, 9/6/34, p. 944, the Economist, 10/2/34, p. 301 and R.I.I.A., Surveys of International Affairs, 1933, p. 92 and 1934, p. 4.

26. According to the Economist (15/12/34, pp. 1144-5), the under-valuation had virtually disappeared by this time and most of the effects of it had worked their way through the American economy. The Economist reiterates this point at a later date (30/5/36, p. 492); indeed some of the calculations in the later article suggest that the dollar had become slightly overvalued against the pound by the end of 1934. In view of this, December, 1934 seems an appropriate cut-off point for any dummy variable which seeks to take account of the dollar's undervaluation.

27. See respectively: Economist, 7/4/34, pp. 768-9 and 5/5/34, p. 972; Lloyds Bank Review, September, 1934, p. 37; Economist, 20/10/34, p. 23 and Lloyds Bank Review, November, 1934, p. 481.

28. The gold clause had been inserted into all American bonds since the "greenback" period and, whilst its exact wording varied, it basically amounted to a promise to redeem the bond in gold dollars. The Gold Clause Judgement related to four cases where the holders of bonds due for redemption were suing the government for the number of gold coins specified by the bond or, in default of that (since the possession of gold had become illegal), for an amount of (depreciated) paper dollars which would equal the value of gold dollars specified in the contract. This would have substantially increased the amount that the government would have to pay to redeem its bonds.

29. Economist, 6/7/35, p. 18.

30. Lloyds Bank Review, March, 1935, p. 164.

31. Yeager (1976), p. 371.

32. Economist, 28/11/36, p. 416.

33. Yeager (1976), p. 371. See also the Economist, 13/11/37, p. 316 and Lloyds Bank Review, December, 1937, p. 718.

34. Economist, 10/4/38, p. 148.

35. Economist, 4/6/38, p. 546.

36. Economist, 6/8/38, p. 286. See also Yeager (1976), p. 372.

37. Economist, 15/10/38, p. 125.

38. Yeager (1976), p. 372.

39. Kemp (1972), p. 103. This point is also made by Sauvy (1969), p. 33.

40. Economist, 2/12/33, p. 1056.

41. Ibid.

42. See Wolfe (1950), p. 110 and Sauvy (1969).

43. Sauvy (1969), p. 23: "Doumergue....was hailed as a saviour....He had little difficulty in putting minds at rest".

44. Economist, 12/5/34, p. 1030: "The recovery of confidence in the franc is one of the most striking features of the past few weeks". See also Lloyds Bank Review, April, 1934, p. 166.

45. In fact Danzig actually succumbed on May 2nd.,1935 and devalued its currency by 42%.

46. Lloyds Bank Review, July, 1935, p. 405 and August, 1935, p. 447.

47. Economist, 16/11/35, p. 966.

48. Lloyds Bank Review, December, 1935, pp. 660-1. See also ibid, February, 1936, p. 67.

49. Economist, 1/2/36, p. 242. See also Yeager (1976), p. 360: "Laval/'s/....resignation created another run on the franc".

50. See the Economist, 8/2/36, p. 308, 28/3/36, p. 712 and 13/12/37, Commercial History Review of 1936, pp. 7-8.

51. This follows the procedure of Marjolin (1938) and Wolfe (1950).

52. See Wolfe (1950), pp. 143-5, Sauvy (1969), pp. 28-9, Economist, 6/6/36, p. 556, 8/8/36, p. 272 and 26/9/36, p. 566 and Lloyds Bank Review, July, 1936, pp. 359-60 and September, 1936, p. 447.

53. See Kemp (1972), p. 123 and Wolfe (1950), pp. 151-2.

54. Lloyds Bank Review, November, 1936, pp. 553-4 and December, 1936, p. 604, Economist, 31/10/36, p. 215 and 217, 14/11/36, p. 313 and Yeager (1976), p. 363.

55. Lloyds Bank Review, April, 1937, p. 180.

56. Economist, 29/5/37, p. 154. See also Yeager (1976), p. 364, and Lloyds Bank Review, April, 1937, pp. 190-1 and May, 1937, p. 248: "The market has lately been inclined to take a less hopeful view of the French financial outlook..."

57. For example, see Lloyds Bank Review, August, 1937, pp. 463-4 and October, 1937, p. 575, Economist, 24/7/37, p. 187, 18/9/37, p. 563 and p. 568.

58. Yeager (1976), p. 364.

59. There were also two groups of partially overlapping dummies: firstly, where the period a (shorter) dummy was "on" fitted entirely within the (longer) period another dummy was "on" - K2 into S3, K3 into S5, K4 into S6, K3 into F3, F1 into S3, F2 and F3 into S5; and secondly, where two dummies overlapped for a month or more - F4 and S6, F9 and S7, F12 and S9.

60. This is an inexact exercise and some insignificant variables may still appear in the final equations. The main reason for this is that where a variable was clearly significant in one version of a particular equation (for example, pound-dollar cost-of-living indices), it was felt to be inconsistent not to include it in other versions of that equation (pound-dollar wholesale prices and pound-dollar wage indices), regardless of its level of significance in the first and second stage estimates of these other versions.

61. The F-statistics for the "economic fundamental" and "speculative" groups (followed in parenthesis by the F-statistic value to be exceeded to indicate significance at the 1% level) were respectively: pound-dollar (COL) 65.5 (2.9) and 44.0 (3.4); pound-dollar (WP) 57.0 (2.9) and 30.1 (3.4); pound-dollar (WG) 52.6 (2.9) and 32.8 (3.4); pound-franc (COL) 271.5 (3.0) and 14.0 (3.0); pound-franc (WP) 186.3 (3.0) and 12.4 (3.0); franc-dollar (COL) 58.2 (2.9) and 26.1 (2.5); franc-dollar (WP) 51.7 (2.9) and 15.3 (2.5).

62. In addition S1 was excluded from the regressions. It represented weakness of the dollar in November, 1931 as attention shifted from the pound to the dollar. Such weakness of the dollar can hardly be expected to show up against the pound which had just depreciated sharply.

63. Hudgins (1973) tried a variety of interest rates and ultimately concluded: "The consistent failure of any interest rate - whether it be a call rate differential, a three month bond differential, or a treasury bill rate - to have a significant effect on the exchange rate indicates that funds did not flow from country to country because of a simple difference in money interest rates". (pp. 222-3).

64. These latter two possibilities are discussed in detail in Ch. 4, Section III.

65. This figure corresponds remarkably well with that of Whitaker and Hudgins (1976) who suggest that "a typical intervention by the EEA altered the exchange rates by between 2 and 8 cents" (p. 1483). It is true that the variable here refers to both British and American

intervention, but if the conclusion of Hudgin's earlier study (1973, p. 220) is correct then the American fund was ineffective anyway and therefore the figures in Table 5.4 are comparable with those of Whitaker and Hudgins. However, Hudgins' earlier work also suggested a somewhat higher value - in the 4-11 cents range (1973, Tables 4.1 - 4.12) - although the figure in the present study still falls within this range.

66. In fact, this variable was significant and correctly signed in the franc-dollar estimates.

67. An alternative explanation would be that this result is supportive of a monetary approach to exchange rate determination which would predict a positive sign for the relative income variable. See footnote 12 of Ch. 4 for an explanation of why a positive sign should be expected.

68. See, for example. Ozmun (1976) Tables 4.5 and 4.6, p. 95 and p. 98 respectively.

69. See, for example, the Economist, 4/4/36, p. 17 and 30/1/37, p. 243.

70. Ozmun (1976), p. 86.

71. This was not done because it would have involved some clumsy and ill-defined averaging process.

72. It is true that the bi-lateral income ratio carried the wrong sign but it was suggested above that probably only one of the two income proxies was indicating a negative income effect and though they are not tested seperately here, the suspicion, based on Ozmun's study (1976), would be that it was the British not French income proxy that was behaving in this manner (See Ozmun, 1976, Tables 4.1, 4.2, 4.3 and 4.7 on pages 82, 88, 90 and 100 respectively). Therefore, the drop in French income at the turn of 1931 can be legitimately put forward as an alternative (to K1) reason for the strengthening of the franc against the pound in spite of the incorrect sign of the ratio form of the variable. A completely different explanation for the insignificance of K1 is that it is "mistimed". This possibility is taken up in the discussion of the residuals for this period in Section IV below.

73. As already suggested it may also have reflected the influence of K3 which was significant in the pound-dollar estimates but surprisingly not in the pound-franc estimates.

74. Ozmun (1976), pp. 84-5.

75. Another possibility is "mistiming" of S1 which is taken up in the discussion of the residuals below.

76. The coefficients of S4 and S5 would suggest that in April-October, 1933 the dollar was undervalued by 7.6-9.1% against the pound and 11.1-12.1% against the franc and in November, 1933 - December, 1934 by 13.9-16.1% against the pound and 15.3-22.1% against the franc.

77. Admittedly this is less true of F9 (October-December, 1936)
which corresponds closely with S7 (October-November, 1936) since
the latter was insignificant in the pound-dollar estimates and
significant and correctly signed in the franc-dollar estimates
(so that the "American effect" is arguably already being picked
up). However, there was some ambiguity about the sign of F9
anyway (Table 5.3, Section II) so it is not entirely implausible
for it to carry different signs in estimates for different exchange
rates.

78. This is actually quite wide; in most of the equations the lower
limit is approximately 1.1 and the upper limit 2.1.

79. $SV = \int (i_F - i_{UK}) - (FR/SP \times 400) \,]$

where i_F = annual foreign interest rate on three month prime bills

$\quad i_{UK}$ = " British " " " " " " "

$\quad FR$ = three month forward premium (+) or discount (-) in
units of foreign currency per pound

$\quad SP$ = spot exchange rate in units of foreign currency per
pound.

80. Although this runs counter to the views of at least one very
important contemporary observer - Governor Norman of the Bank of
England - who certainly thought that it did. See Howson (1980), p. 39.

81. Thus, for example, political uncertainty in France may, on the one
hand, have caused British owners of capital in France to repatriate
it whilst having no effect on American owners of capital in France
and, on the other, caused French owners of capital in France to
shift their funds out of the country mainly to Britain. Therefore
the franc might have weakened against the pound but not the dollar
and hence, a speculative dummy seeking to pick up such capital
movements would be significant in the pound-franc but not the
dollar-franc estimates.

82. Some variables excluded from the final equations because of
insignificance in the first stage estimates were restated in the
CORC estimates. In particular, the pound-franc ID ("wide" version)
was included in the pound-franc estimates.

83. This is an iterative process which involves obtaining estimates
of the autoregressive parameter, rho (p), from the residuals of the
original OLSQ estimates, re-estimating the transformed equation

$(\int Y_t - \rho \, Y_{t-1} \,] = \alpha \int 1 - \rho \,] + \beta \int X_t - \rho \, X_{t-1} \,]$, etc.)

and then repeating the procedure using the value of ρ calculated
from the residuals of the transformed equation and so on until the
value of ρ converges.

84. Allied to this, is the further problem that as more than one
variant of each exchange rate is used, different variants may
have different patterns of residuals. Fortunately, this problem
does not materialise, particularly in the potentially most likely
case (because there are three variants) - the pound-dollar - in
which the three sets of residuals are virtually identical.

85. This gold outflow occurred throughout the October-December, 1931 period but, it was argued, was at its heaviest in October, which is why S1 covered that month. (S1 was not used in the pound-dollar estimates as it was not applicable. See footnote 25 above).

86. Economist, 9/7/32, p. 57.

87. Economist, 27/1/34, p. 179. In fact, this leads to the wide version of the pound-franc ID having a value of -1 in January, 1934.

88. It must be conceded that this is not a strong argument. S6 was, in fact "wrongly" signed since the dollar was expected to be strong in early 1935, partly because of the impending gold clause judgement which affected January in particular. The argument that S6 reflected continued undervaluation of the dollar was originally introduced as an explanation of its "wrong" sign.

89. In addition, the franc apparently rallied in July. See footnote 52 (above).

90. See the Economist, 19/9/36, p. 569 and 25/9/36, p. 618.

91. The values of S7 are -0.45 (COL) and -0.66 (WP) and of F9 are -0.69 (COL) and -0.39 (WP). These would suggest the following combined effect:

	Oct.	Nov.	Dec.
COL	-1.14	-1.14	-0.69
WP	-1.05	-1.05	-0.39

The residuals are identical (with opposite signs) in October and December in both COL ($\pm$ 0.29) and WP ($\pm$ 0.22) versions. This would adjust the above effect to indicate that the pressures causing franc weakness became progressively weaker:

	Oct.	Nov.	Dec.
COL	-1.33	-0.85	-0.69
WP	-1.28	-0.82	-0.39

92. See the commentary on events in France and potential influences on the franc in Section II of this chapter above.

93. See the Economist, 7/5/38, pp. 302-3, for example.

94. Using R-squareds, Durbin-Watson statistics, t-statistics and the standard errors of the regression as criteria, the regressions involving predicted direct rates were clearly "better" than those using predicted cross-rates.

CHAPTER 6

THE REST OF THE GOLD BLOC: THE BELGA,

THE GUILDER AND THE SWISS FRANC

(I)

Following the abandonment of the gold standard by Britain
in 1931, a number of European countries stayed on gold with France
and formed what came to be known as the gold bloc. Although in a
sense these correncies were "fixed" (to gold) for much of the period,
some of them - the "free gold bloc currencies", that is those which
did not engage in extensive exchange controls (like Italy) - might
provide a further testing ground for the model developed here, to the
extent that other currencies, like the pound floated against them and
hence the pound-belga exchange rate, for example, could be viewed as
"floating" (even though Belgium was on the gold standard). Further-
more, the guilder and the Swiss franc actually did float after the
final collapse of the gold bloc in 1936.

Nevertheless, it might still be argued that the course of the
belga, guilder and Swiss franc was largely determined by the relation-
ships within the pound-dollar-franc triangle and that the exchange
rates of these minor gold bloc currencies against these three major
currencies were little more than cross-rates. However, whilst this
may be true to a point, it might still be expected that the basic
hypotheses of the model should hold in the sense that these currencies'
exchange rates could not stray too far away from the path indicated
by "economic fundamentals" and the model is therefore applicable in a
permissive sense. Thus the relationship between the exchange rates

of the minor gold bloc currencies and the variables in the model
is still hypothesised to hold but in a much looser sense although
some indication that relative prices and the other "economic
fundamentals" were important is still expected. In view of this,
however, the depth of study of these currencies will be rather less
than for the pound-dollar-franc triangle: only exchange rates between
each of the three minor gold bloc currencies with each of the three
major currencies will be examined (nine exchange rates in all) and
the results will be presented and analysed more briefly; for example,
there will be no detailed analysis of the residuals. This is in line
with the lesser importance of these currencies and the lesser applica-
bility of the model.

The estimation procedure will, nevertheless, be the same
although there is an additional problem in that for each of the three
minor gold bloc currency exchange rates considered there will be two
potential "third countries" to represent the ROW. It may seem obvious
that France, as the leading gold bloc currency, should represent the
ROW wherever possible but, not only does this not solve the problem
for exchange rates involving the French franc, it is also rather
contentious. The importance of the U.K. and U.S. to these countries
should not be overlooked both in terms of their positions as major
countries in the world economy and also in terms of specific links;
for example, Britain was one of Holland's two major trading partners
(and the other was Germany not France) and Belgium was technically
linked with the U.S. in 1936-8 due to the fact that they were both
on the gold standard and indeed, the belga (and also the guilder and
the Swiss franc) moved with the dollar in the 1937-8 period on occasion.
The solution to the problem adopted here was to use both potential third

countries.[1] For example, in the belga-pound case, two sets of
preliminary estimates, one using the U.S. as the ROW and the other
France, were estimated and the significant third country variables
of both the U.S. and France were included simultaneously to produce
only one set of estimates in later stages.

Before examining the economic history of these countries to
derive speculative dummies, it might be useful to give a brief over-
view of the movements of the belga, guilder and Swiss franc in the
1930's. The history of the belga is very straightforward: it remained
on the gold standard until the end of March, 1935 when it was devalued
by 28% and the gold standard was maintained at this new value for the
rest of the 1930's. With this one exception then, exchange rate
movements of the belga were dominated by changes in the other currency:
thus the belga appreciated unevenly against the pound in the September,
1931 to March, 1935 period, then depreciated sharply to a value
approximately 20% higher than its 1929 value where it stayed until
appreciating slightly in late 1938; it does much the same against
the dollar only the appreciation is in the April, 1933 to March, 1935
period and there is no appreciation in late 1938; finally, the belga
hovers around its gold parity with the franc until the sharp devalua-
tion to a new parity in late March, 1935 where it remains until the
franc begins its decline in late 1936 which continued until late 1938.

The fluctuations of the guilder against the major currencies
were very similar to those of the belga, only the guilder depreciated
not in March, 1935 but at the end of September, 1936. There were also
two other differences: firstly, the depreciated level of the guilder
was 30% (not 20%) above its 1929 value against the pound and the dollar
in October, 1936 and, indeed, it actually appreciated by 10% against

the franc; secondly, and more importantly, the guilder did not readopt the gold standard at a lower parity but, according to the Dutch authorities, was floated - "we just want to see how the guilder will manage"[2] - although it is probable that the guilder was temporarily and unofficially pegged to the dollar for part of 1937.

The course of the Swiss franc in 1931-8 was virtually identical to that of the belga with the obvious difference that the Swiss depreciation came in late September, 1936 (like the guilder) although the new level of the Swiss franc was similar to the belga's rather than the guilder's (in terms of its relationship with 1929 values). However, the type of exchange rate regime adopted by Switzerland was unlike that of Belgium or Holland in that the Swiss franc was neither fixed at a new gold parity nor freely floated; instead it was allowed to float but with the intention of trying to maintain its value approximately 10% above that of the pound and the dollar; further-more, like the guilder (and belga), the Swiss franc moved with the dollar for part of the autumn, 1936 to 1938 period (though certainly not all of the time).

(II)

In spite of the importance of external pressures in determining the exchange rates of the minor gold bloc currencies, it seemed desirable to allow for possible speculative effects by deriving dummy variables in the same way as this had been done for the three major currencies and this exercise is carried out for each country in turn below. It would be useful to begin the discussion of Belgium and the belga with a few general points. In the first place, it should

be noted that there was a strong "psychological" link between the
belga and the French franc, even as late as 1938:

> "The position of the belga has undoubtedly been
> affected by the recent depreciation of the French
> franc.....It is true that economic ties linking the
> two countries are no longer so close.../nor are/...their
> political relations. But the psychological link is still
> there and its power has been clearly demonstrated lately". (3)

This would imply that any weakness in the French franc would be
transferred (via speculation) to the belga.

However, this relationship should not be overstressed: in
autumn, 1938, the belga (for a time) strengthened with the dollar,
even though other European currencies were weakening, because of the
indirect link with the dollar due to both currencies being on the gold
standard; furthermore, there were those who believed that Belgium's
strongest attachment (via trade flows) was with the sterling bloc and
that after the March, 1935 devaluation the belga should have been
tied to sterling not gold, or even that the belga ought to have
followed the pound in 1931.[4] A second major characteristic of
Belgium in the 1930's that is particularly relevant here is that,
mainly because of its position as an open economy, Belgian protec-
tionism was generally half-hearted with a preference for "a policy
of negotiation....to one of direct attack".[5] This would indicate
that distortions due to tariffs and other import controls are likely
to be less of a problem in the Belgian case. This is not necessarily
true of speculation, however, and attention is now turned to deriving
dummy variables to allow for this.

The British abandonment of the gold standard in 1931 caused very
little alarm in Belgium. Indeed, in February, 1932, a contemporary

source was moved to comment:

> "The general trust in the Belgian currency has caused
> the belga to stand at a premium in the exchange market,
> even in ratio to the French franc exchange except in
> September...." (6)

This confidence seems to have continued into the first half of
1932 despite a slight change in the composition of the government
in May. However, in July, 1932, there was a miners' strike and
even riots when some miners refused to accept wage cuts; the government,
with less than a year left to run, was reluctant to deal with this and
the further cuts in expenditure needed to balance the budget and
eventually chose to resign (in October). Thus July-October, 1932
represents a period of probable belga weakness. On the election of a
new government, in November, confidence returned and November-December,
1932 may well have represented a period of belga strength.

In 1933 the budget was brought back into balance (with the
government ruling by decree for a period) and:

> "The currency was stable throughout the year". (7)

This was undoubtedly due to the internal political stability of
Belgium and also the country's general monetary position:

> "The monetary situation of the country remains very
> strong....Belgium is the only country still on the
> gold standard which has seen its gold reserves
> increase in the last six months". (8)

No speculative dummies would therefore seem to be required for 1933.

However, the story is rather different in 1934, a year of
recurrent speculation about the future of the belga, which became
particularly excessive towards the end and carried on into 1935 until

the belga was devalued in late March. The deterioration began in mid-1934 with the fall in gold prices necessitating further deflation (if Belgium were to maintain the gold standard) at the same time as the effects of the U.S. undervaluation were beginning to be felt. At the end of September, the members of the gold bloc met and confirmed their intention to maintain the gold standard; the necessity to do this might have been interpreted as a sign of weakness. A week later the belga developed "sudden weakness as a result of the political crisis at the end of last week"[9] which involved rows over further deflation culminating in the resignation of two ministers. The arguments continued and ultimately the whole cabinet resigned (on November, 13th). To some extent this reflected a growing debate within the country in which those in favour of devaluation were rapidly gaining ground. The effect on the belga was a further decline in confidence:

> "Rumours of devaluation and the consequent capital outflow
> became particularly intense in November, 1934". (10)

Loans were raised in America (in November) and Switzerland and Holland (in December) but the problems continued.

Matters were not helped by the fact that this loss of confidence in the belga coincided with a major banking crisis which, according to one source was ultimately the main cause of the devaluation:

> "The need for fundamental reform in Belgian banking had
> become glaringly apparent in the banking crisis late in
> 1934 and early in 1935, which more than any other was the
> factor immediately responsible for the devaluation of the
> belga...." (11)

Thus the weakness continued into 1935 and, indeed, intensified in February when it became clear that the Socialist Party would strongly

resist further deflation. In March, an attempt to persuade the
French to give concessions in a bilateral trade and financial
agreement (to help prop up the belga) failed. On March 19th, the
government resigned and by March 26th planeloads of Belgium currency
were being flown out of the country to be sold for what they would
fetch.[12] At the end of the month the newly formed "National
Government" devalued the belga (by 28%). This sustained period of
pressure on the belga obviously requires some kind of representation
in the model and it was decided to use two speculative dummies (to
try and take account of the differing degree of intensity of the
speculation), BG3 (September, 1934 - January, 1935) and BG4 (February-
March, 1935), both of which are expected to be associated with belga
weakness.

The next year witnessed a dramatic change in Belgium as
prosperity very rapidly returned and no more speculative dummies
are required until June, 1936, when a variety of political influences
may have led to uncertainty about Belgium and the belga (and hence
weakness). Although the election in late May left the three major
parties with the majority of the seats, the improved position of
the extremist parties - the Communist and a new (fascist) party, the
Rexists - gave a certain shock to confidence which was further
undermined by the delay and difficulties of forming a new government
(it took three weeks) and by an outbreak of strikes in June. A fifth
speculative dummy will therefore be included for June, 1936.

The focus of attention in 1936 was, however, very much on the
rest of the gold bloc which ultimately collapsed in late September.
It seems reasonable, nevertheless, to suppose that there may have
been some effect on the belga, probably a weakening,[13] and at least

to include a variable in the October-December period to test for
this.[14] In the first half of 1937 there is no evidence of
speculative effects but in July the belga apparently weakened due
mainly to events in France and the "psychological" link between the
two countries[15] and also further internal political uncertainties
(connected with the Rexists).

The real problems for the belga, though, came in the latter
part of the year and continued into 1938. In September there was an
internal political scandal involving the Prime Minister which had an
immediate effect on the belga:

> "The crisis in Brussels gave rise to a transfer of funds
> to New York". (16)

Nor was the situation helped by the troubles of the French franc.
In late October, the Prime Minister resigned which led to fears of a
more left wing government and hence the belga stayed weak. In fact,
it took four weeks to form a new government and confidence continued
to wane until the end of the year.

In the new year (1938), this decline was fuelled by more trouble
with the miners and a government decision to increase taxation. Matters
took a further turn for the worse in March, initially set off by fresh
weakness in the franc:

> "The fall in the French franc has put a severe strain on
> the belga. Capital is leaving the country". (17)

Budget difficulties were causing internal political problems and in
late April the Finance Minister resigned, quickly followed by the entire
government (on May 5th). Thus the reasons for the belga weakness in
March-May, 1938 were twofold:

"The unfortunate coincidence of a political crisis
with a devaluation of the French franc has provided
the required background for this attack on the belga
to develop". (18)

Thus there are good reasons to believe that the belga was weakened

by speculative forces in the whole of the September, 1937 - May, 1938

period. However, two separate dummies will be used - BG8 (September,

1937 - February, 1938) and BG9 (March-May, 1938) - partly to reflect

the probability of differing intensities of the speculation and partly

because, in a sense, the March-May, 1938 weakness had different causes.

The Belgian speculative dummies are summarized in Table 6.1.

TABLE 6.1:   BELGIAN SPECULATIVE DUMMIES

VARIABLE	PERIOD ON	TENDENCY OF BELGA	REASON	INAPPLICABLE TO
BG1	July-Oct. 1932	weak	Strikes, unrest, government resignation.	
BG2	Nov.-Dec. 1932	strong	New government and return of confidence.	
BG3	Sept. 1934 - Jan. 1935	weak	Loss of confidence for various reasons (including fall of the government and banking crisis)	
BG4	Feb.-March 1935	weak	Accelerated loss of confidence (various reasons).	
BG5	June, 1936	weak	Strikes, difficulties in forming a government (after elections).	
BG6	Oct.-Dec. 1936	weak	Sympathy with French franc.	France
BG7	July, 1937	weak	Sympathy with French franc.	France
BG8	Sept. 1937 - Feb. 1938	weak	Loss of confidence for various reasons (including an internal political scandal).	
BG9	Mar.-May 1938	weak	Accelerated loss of confidence (various reasons).	

In many ways Holland had the most depressing experience in
the 1930's of the countries in the study[19] and unlike the others
(such as Belgium) experienced only a very brief recovery after
abandoning its old gold parity in 1936; the Economist's economic
reports on Holland in the 1930's carry the heading "Unemployment
Rising" with depressing regularity. More specifically there are two
characteristics of the Dutch economy which might be highlighted in the
present context (before examining events in detail), both of which
may act to undermine the model developed here. In the first place,
the Dutch supported the gold standard with a fervour that was almost
religious, led by the Governor of the Central Bank who vowed, on taking
office in October, 1931:

> "With all the means within my power I shall maintain the
> standard of our coinage". (20)

Nor was this feeling in any way diminished by mid-1936:

> "Holland may put up a longer resistance to the forces
> of devaluation. The authorities in that country are
> probably more rigidly orthodox and deflationist than
> anywhere else in the world". (21)

This extreme "orthodoxy" may have created pressures that caused the
guilder to deviate from the path indicated by "economic fundamentals".

A second distortion may have been created by the strong protectionist
policy of Holland, although in fairness this was largely retaliatory.
Nevertheless:

> "The Government of the Netherlands still pursues its active
> protectionist policy. The system of quota restrictions on
> imports is constantly being extended". (22)

> "The quota policy of the Dutch government is being pursued
> unremittingly". (23)

Moreover, the Dutch were not prepared to backtrack on their protectionist policy after the devaluation (as the Belgians had done). Although it is true that Dutch protection was retaliatory and, insofar as it merely offset foreign protection, there could have been a cancelling out leaving the influence of relative prices and other "economic fundamentals" undistorted, this is rather tenuous and the applicability of the model to the guilder may turn out to be limited.

During the 1931-8 period Holland displayed remarkable political stability, much more so than Belgium (or France), being governed by the same right wing coalition and having the same prime minister (except for a short period in 1935). This may have been expected to instil confidence in the country and the currency but, nevertheless, there were still periods during which speculative influences may have been operative and these should be examined. The British abandonment of the gold standard had a minimal effect on the guilder which is not surprising; given the strong Dutch feelings about the gold standard, there was no question of the guilder following the pound and consequently no evidence of speculation to this effect either in late 1931 or throughout 1932. However, the American depreciation in 1933 did cause "fears that the guilder would have to follow the fate of the dollar"[24] and, in particular, the guilder experienced difficulties in May and June:

> "In the early summer....Holland....suffered such a panic flight of capital that.../it was/...within measurable distance of having to suspend gold payments". (25)

Indeed, it was the "run on the guilder /that/ precipitated a move towards the formal organisation of the 'gold bloc' "[26] in July which

seems to have brought this period of speculation to a halt. The first Dutch dummy, therefore, reflects guilder weakness in May-June, 1933.

The guilder suffered no further setbacks in 1933 but in 1934 there were two periods which may have been associated with guilder weakness. In February-March there was an influx of gold into the U.S. which exerted a deflationary effect on the gold bloc currencies and led to fears about their ability to remain on gold; this may have particularly affected the guilder, given the comparatively greater depth of the depression in Holland, and therefore may require a dummy variable. In July, there were Communist-led riots in Amsterdam and lesser disturbances in three other cities in protest against the policy of deflation and expenditure cuts (necessary to maintain the gold standard); in August a coal strike was narrowly averted and the budget deficit was causing concern; by September it was becoming increasingly clear that further wage cuts were out of the question as prices were actually rising.[27] However, the gold bloc collaboration agreement at the end of September may have restored some degree of confidence, but a speculative dummy for the whole of the July-September, 1934 period would still seem appropriate.

The year 1935 continued in the same vein with intermittent "runs" on the guilder. The first of these, in early 1935, was related to the gold clause judgement in the U.S. and is therefore picked up by an American dummy (S6) but the others were more specifically related to Holland. The devaluation of the belga in late March, 1935, not surprisingly led to fears about the other members of the gold bloc, including the guilder. In fact Holland lost a great deal of gold in the first fortnight of April as the run on the currency reached alarming

proportions.   The problems continued:

> "During May the gold bloc currencies were subject to
> heavy pressure". (28)

The situation eased in June but an even worse crisis developed in
July when Dr. Colijn, the Prime Minister, could not raise the support
to get his retrenchment bill through Parliament:

> "...this spelt the defeat of M. Colijn's deflationary
> policy, and therefore, in the eyes of the world, the
> end of the attempt to bolster up the value of the
> guilder. The exchange crisis followed inevitably". (29)

However, the opposition could not form a government and so within
four days (July 30th) Colijn returned to office, and confidence (and
gold) returned.

The problem was not so much that Holland lacked the technical
position to stay on gold but rather whether the country could take
the required deflation. For the time being it seemed that it could:

> "At the expense of continued internal economic stagnation,
> the guilder weathered attacks against it in April and May
> and again in July, 1935". (30)

Unfortunately, this proved to be only temporary and the return of
Parliament from its summer recess in September was awaited with some
trepidation and its approach was sufficient to set off a fresh flight
from the guilder. The budget deficit that Colijn had been trying to
cover with his retrenchment bill had widened and, in addition, the
devaluation movement was gaining ground having "derived stimulus
from the proximity of Belgium to Holland".[31] It was only at the
end of the month, following two statements by Colijn that his government
would do everything in its power to maintain the gold standard, that

confidence began to return. Thus three speculative dummies are required for 1935 - April-May, July and September - all representing guilder weakness.

In 1936 the guilder's position remained technically strong but fears about the ability of Holland to tolerate further deflation grew and, in June, difficulties in France spilled over into Holland and there was another run on the guilder:

"The guilder has...been at the very centre of the storm". (32)

More statements of the commitment to the gold standard stemmed the flow but a Dutch speculative dummy for June, 1936, still seems appropriate. Finally, in late September, in the wake of the French and Swiss francs, the guilder succumbed and abandoned the gold standard,[33] entering into its "floating" phase and depreciated. In the October, 1936 to December, 1938 period there was little evidence of any major speculative effect. For much of 1937 the guilder apparently moved in line with the dollar, although not all the time, and this year contains the only significant speculative influence in the late 1936 to end-1938 period: in May there was a large influx of gold which forced the Dutch Equalisation Fund to lower its buying rate for dollars which led to rumours of impending guilder revaluation; this will be represented by the final Dutch speculative dummy (H8), the only one associated with guilder strength. The Dutch dummies are summarized in Table 6.2.

Switzerland was the smallest of the gold bloc countries. It has a number of other characteristics though, relevant here, which it shared with Holland: in the first place, it embraced the gold standard with a similar (if slightly lesser) degree of intensity to that of Holland

TABLE 6.2:   DUTCH SPECULATIVE DUMMIES

VARIABLE	PERIOD ON	TENDENCY OF GUILDER	REASON
H1	May-June, 1933	weak	Adverse reaction to U.S. leaving gold.
H2	Feb.-April 1934	weak	Gold influx into U.S. leading to Dutch deflation.
H3	July-Sept. 1934	weak	Political disturbances.
H4	April-May, 1935	weak	Belga leaving gold.
H5	July, 1935	weak	Defeat of Dutch government.
H6	Sept. 1935	weak	Budget deficit, general loss of confidence.
H7	June, 1936	weak	Loss of confidence.
H8	May, 1937	strong	Gold inflow and rumours of revaluation.

whilst, at the same time, pursuing a (similar) commercial policy which was far reaching but not particularly aggressive; in addition, Switzerland too exhibited great internal political stability and this together with the small size of the country, may diminish the likelihood of there being any internal events which could have been strong enough to exert speculative effects.   There are also two aspects of the economy peculiar to Switzerland alone.   Firstly, the importance of tourism, particularly the winter season, may give a strong seasonal variation to the Swiss exchange rate (although the number of tourists declined dramatically during the depression).   Secondly, Switzerland had a role as a safe haven for funds in the 1930's (as it does now) because of its neutrality and this may distort the hypothesised effect of interest rates in the model; for example, in 1937-8, Switzerland was awash with foreign funds, so much so, that in early 1938 a scheme was devised to discourage further capital inflows by charging a commission on foreign deposits.   Turning from general factors to more specific ones, it is

necessary to briefly examine the economic history of Switzerland
to search for possible causes of speculative effects (even though,
as indicated above, there might be some scepticism about their
likely importance).

Britain's abandonment of the gold standard induced a "dumbfounded
attitude"[34] in Switzerland and led to rumours about the country's
ability to remain on gold but little else because:

> "...\[Switzerland's financial\]...position is stronger now
> than it has been for some years and deserves the confidence
> which Swiss and foreign investors have placed in it". (35)

However, the pound's depreciation did help to bring the depression
to Switzerland, to which it had been to some extent immune, due to
its comparatively low level of industrialisation, and the Swiss found
their export and tourist trades increasingly in difficulties. The
weakness in the economy ultimately transferred itself to the currency
which, towards the end of 1932, was plagued by rumours of impending
devaluation:

> "The culminating point was reached in the closing weeks
> of the year, when the fall of the French government and
> rumours of Swiss banking difficulties caused...the Swiss franc...
> to fall to...\[an\]...appreciable discount...." (36)

Consequently, December, 1932 represents the first Swiss period of
speculative influence which is expected to be associated with weakness.

The U.S. decision to leave the gold standard in 1933 created a
brief adverse reaction in Switzerland in March but, as with Holland,
the real difficulties came in May and June:

> "During May and June the conviction gained ground that
> ....\[Switzerland\]....would have to abandon gold, and as
> a result there was a serious flight of funds...." (37)

In July, following the formation of the gold bloc, the Swiss franc
recovered but a second speculative dummy for May-June, 1933 seems
appropriate. This renewal of confidence appears to have sustained
the Swiss franc during the rest of 1933 and throughout 1934; indeed,
it seems to have peaked in September-November, 1934 and therefore
give cause to include a speculative dummy to take account of expected
Swiss franc strength in these months. This was probably initially
caused by the gold bloc collaboration agreement in September and the
realisation that Switzerland was probably the "strongest" gold bloc
member[38] and further fortified by the successful formation of new
governments in France and Belgium in November allied with the pre-
dominance of pro-gold standard feeling in Switzerland itself:

> "The devaluationists seem recently to have lost some ground
> and the government is stubbornly resolved to maintain the
> gold standard". (39)

The year 1935 began with a flurry of activity due to the
impending gold clause judgement in the U.S. which may have weakened
the Swiss franc to some extent but is more properly viewed as an
American speculative influence. In any case, much more serious
weakness occurred in the spring, initially set off by the defection
of the belga from the gold standard in late March. The Swiss franc
seemed to be particularly affected:

> "There is a general lack of confidence in the gold bloc
> currencies, which is most marked in Switzerland". (40)

There were a number of reasons for this, most obviously the continued
downward trend in the Swiss business situation and also the fact that
the Swiss banking situation was known to be weak.[41] It could be
argued, of course, that these problems were not unique to Switzerland

but a third element operating at this time certainly was and could

be expected to lessen confidence in the currency. This was the

referendum on the "Kriseninitiative", a Socialist proposal aiming

"to assure to all Swiss citizens a sufficient livelihood", [42] which

was to be held on June, 2nd. Exactly how a "sufficient livelihood"

was to be assured was not spelt out in detail but it was clear that

the means would be inflationary and hence would threaten Switzerland's

adherence to the gold standard. In fact, it was the rejection of

the "Kriseninitiative" in early June which restored confidence, so

much so that:

"By June 1935, the run on the Swiss franc subsided". (43)

Thus a dummy variable for April-May, 1935 seems appropriate.

The Swiss franc then entered into an uneasy period of respite

during which any weakness elsewhere in the gold bloc tended to be

transmitted to Switzerland. However, the situation did not deteriorate

excessively until April, 1936, when many of the various influences

that had been undermining the Swiss franc combined to cause sudden

weakness, initially set off by events elsewhere in the gold bloc:

> "The sudden weakness of the Swiss exchange was due to...
> a further efflux of capital from Switzerland, a movement
> prompted by the turn of /political/ events in France....
> This development happened to coincide....with reports of
> troop movements on the Austro-German frontier and thus
> exerted its maximum effect on somewhat frayed financial
> nerves.....Quite apart from these external influences
> the situation in Switzerland has not been developing at
> all happily....a precarious budget situation has been
> thrown completely out of equilibrium by the decision to
> embark on....an exceptionally expensive programme of
> rearmament and frontier fortification. Further, the
> banking position....remains unsatisfactory and....the
> balance of payments is deteriorating". (44)

Any relief in May was short-lived because the situation flared up once

again in June:

> "The...gold bloc exchanges were weak. Forward Swiss
> francs and guilders went to wide discounts against
> sterling...." (45)

These two months - April and June - are the only two months
in 1936 that would seem to require speculative dummies because the
devaluation of the Swiss franc in the autumn was not preceded by a
period of panic; indeed the Swiss tended to gain gold rather than
lose it in the twelve month period immediately preceding devaluation
(admittedly mainly at the expense of France). In fact, the initial
Swiss reaction to the French devaluation was a public announcement
that the Swiss franc was to stay on the gold standard although this
decision had to be reversed within a matter of hours as gold began
to leave the country. Nevertheless, the effect of the devaluation
on Switzerland was beneficial and fairly dramatic: the upturn had
already begun in the spring of 1936 and the depreciation accentuated
recovery considerably. The tourist trade improved to the extent of
contributing to apparent Swiss franc strength (and the need for a
dummy variable) in February, 1937:

> "Swiss francs have been firm owing to further repatriation
> of capital and a successful winter sports season". (46)

For the first time, since the beginning of the depression,
income from Swiss invisibles offset the visible trade deficit and
this encouraged the inflow of funds even more. Capital continued to
flow into Switzerland throughout 1937 to the extent that, by the end
of the year, money was so abundant that it was being suggested that
steps be taken to reverse the flow and get rid of some of the excessive
amount already in Switzerland. In the first two months of 1938 (the

height of the tourist season) the influx became very excessive
due mainly to the favourable balance of payments and a scheme was
adopted for repelling unwanted capital by charging a commission on
foreign deposits. This period - January-February, 1938 - will be
represented by the eighth dummy variable, also associated with Swiss
franc strength.

In April, however, the flow reversed itself:

"Swiss francs weakened...as a result of repatriation
of funds to France". (47)

There were two main reasons for this: firstly, the German annexation
of Austria caused much uneasiness about the neutral position of Switzerland;
and secondly, there were rumours to the effect that the Swiss franc would
be affected by the recent depreciation of the French franc. But, later
in the year, the Swiss franc strengthened when it apparently moved with
the dollar in the October-November period. These events provide the
reasons for the final Swiss speculative dummies covering April and
October-November, 1938. The Swiss dummies are summarized in Table 6.3.

TABLE 6.3: SWISS SPECULATIVE DUMMIES

VARIABLE	PERIOD ON	TENDENCY OF FRANC	REASON	INAPPLICABLE TO
SW1	Dec. 1932	weak	Rumours of banking difficulties, fall of French government.	
SW2	May-June, 1933	weak	Adverse reaction to U.S. leaving gold.	
SW3	Sept.-Nov. 1934	strong	Increased confidence (various reasons).	
SW4	Apr.-May, 1935	weak	Belga leaving gold, "Kriseninitiative."	
SW5	April, 1936	weak	Capital outflow (various reasons).	
SW6	June, 1936	weak	Capital outflow.	
SW7	Feb. 1937	strong	Capital inflow, revival of tourism.	
SW8	Jan.-Feb. 1938	strong	Excessive inflows of Foreign capital.	
SW9	May, 1938	weak	War scare, French franc depreciation.	
SW10	Oct.-Nov. 1938	strong	Sympathy with U.S. dollar	U.S.

(III)

There were three exchange rates examined for each of these
(minor) gold bloc currencies giving a total of nine in all. These
were estimated in the same way as the pound-dollar-franc triangle with
two versions of each (WP and COL) and a series of estimates initially
including all variables but gradually dropping all insignificant
variables until "final equations" were produced.[48] Before considering
these, however, the speculative dummy variables should be examined
for overlap with British, French and American dummies. There is a
substantial amount of this which is not surprising given the relatively
large number of dummy variables involved. Even so, it would not be
particularly useful to catalogue and discuss every incidence of
overlap. In some cases partially overlapping variables reflect
different influences, sometimes working in the opposite direction,
and it is therefore necessary to include them both and so there is
nothing to discuss. Nevertheless, in many cases, overlapping dummies
may have offset or reinforced each other but it would be more appro-
priate (and less tedious) to only discuss those cases where this
actually seemed to happen, that is in the examination of the empirical
results.

There is, however, one specific type of overlap that should be
dealt with at this point: this is where two variables coincide exactly.
There are four cases of this: BG2 with F1, BG6 with F9, H4 with F4
and SW4 with F4. Inclusion of both variables when they are perfectly
collinear would lead to indeterminancy of the coefficients and so one
must be excluded and the one remaining is implicitly testing for
significance of both sets of influences. In the second case (BG6/F9)

there is no problem because BG6 represents a possible sympathy weakening of the belga with the franc and is therefore not applicable to the belga-franc exchange rate anyway. In the other three examples, all involving French franc exchange rates, the overlapping French dummies (F1, F4 and F4 respectively) are omitted.

The final equations involving the belga are presented in Tables 6.4A-6.4C. In general, the model seems to have been fairly successful in explaining fluctuations in the belga in the 1930's. There are significant (and correctly signed) relative price and income effects in the estimates of all three exchange rates whilst the R-squareds are very high and there is no firm evidence of serial correlation (although the Durbin-Watson statistics are in the inconclusive range so that its existence cannot actually be rejected). Turning to the belga-pound estimates first, not only is there clear evidence that the bi-lateral "economic fundamentals" - relative prices and, to a lesser extent, incomes - were important but there seems also to have been a highly significant ROW "economic" effect.

This includes the French-U.K. interest rate differential whose significance indicates that a rise in U.K. interest rates compared to French rates caused the pound to strengthen not only against the franc[49] but also the belga; this could be evidence of the purported "psychological" link between the franc and the belga. However, the significance and "wrong" sign of the Belgian-U.K. interest rate differential is puzzling. It may indicate that a rise in Belgian interest rates did not attract funds but instead was interpreted as a sign of weakness. It may also be the case that changes in French interest rates were more important than changes in Belgian rates, for Belgian exchange rates; this is supported by the insignificance of the Belgian-U.S. differential and

TABLE 6.4A[1]: BELGA-POUND FINAL ESTIMATES

VARIABLE		COL	WP
Constant		18.4 (2.75)	48.6 (13.5)
U.K. prices/Belgian prices		-16.0 (2.22)	-28.5 (12.1)
U.S. prices		71.5 (10.4)	21.0 (4.18)
French prices		-13.5 (6.72)	-8.64 (7.51)
U.K. income/Belgian income[2]		-8.01 (4.89)	-0.83 (0.52)
U.S. income[3]		-17.3 (6.42)	0.22 (0.06)
Belgian-U.K. interest rates		0.72 (3.04)	0.45 (2.68)
French-U.K. interest rates		-0.21 (1.31)	-0.51 (3.71)
Seasonal Variables:	A1	-0.62 (3.51)	-0.89 (5.82)
	B1	0.59 (3.76)	-0.05 (0.29)
Trend		0.06 (4.01)	0.06 (3.87)
Speculative dummies:	K1	-0.71 (1.02)	-1.26 (2.07)
	K3	-2.53 (4.54)	-1.93 (3.93)
	BG2	-1.85 (2.82)	-1.31 (2.24)
	BG3	-5.13 (11.3)	-2.19 (4.24)
	BG4	-6.55 (9.77)	-3.65 (5.49)
	BG6	0.49 (0.86)	0.53 (1.01)
	BG8	0.60 (1.40)	1.29 (3.35)
	BG9	1.59 (2.57)	0.81 (1.43)
R-SQUARED		0.95	0.96
DURBIN-WATSON STATISTIC		1.11	1.68
STANDARD ERROR OR THE REGRESSION		0.803	0.725
F-STATISTIC		68.9	83.4

Notes: 1.   T-statistics in brackets.

2.   U.K. Belgian employment indices.

3.   U.S. employment index.

TABLE 6.4B: BELGA-DOLLAR FINAL ESTIMATES

VARIABLE		COL	WP
Constant		10.4 (6.39)	11.9 (17.1)
U.S. prices/Belgian prices		-1.17 (1.28)	-1.65 (3.07)
U.K. prices		0.66 (0.42)	-1.02 (1.76)
U.S. income/Belgian income[1]		-2.75 (5.01)	-2.27 (4.59)
U.S.-French interest rates		0.09 (3.42)	0.07 (2.59)
Pound-dollar ID		-0.06 (1.89)	-0.06 (2.21)
Seasonal variables:	A1	-0.11 (3.34)	-0.07 (2.22)
	A2	0.10 (2.86)	0.10 (3.10)
	B1	0.12 (3.07)	0.10 (2.73)
	B2	-0.07 (2.21)	-0.06 (2.13)
Trend		-0.01 (3.29)	-0.01 (3.90)
Speculative dummies:	BG3	-0.31 (2.59)	-0.19 (1.59)
	BG4	-0.87 (4.16)	-0.80 (3.98)
	S4	-1.41 (11.9)	-1.33 (15.6)
	S5	-1.77 (17.1)	-1.53 (13.6)
	S6	-0.67 (3.71)	-0.39 (1.92)
R-SQUARED		0.96	0.97
DURBIN-WATSON STATISTIC		1.95	2.01
STANDARD ERROR OF THE REGRESSION		0.199	0.190
F-STATISTIC		122.8	135.1

Notes: 1. U.S. and Belgian employment indices.

TABLE 6.4C: BELGA-FRANC FINAL ESTIMATES

VARIABLE		COL	WP
Constant		58.8 (8.13)	70.2 (11.1)
French prices/Belgian prices		-36.5 (12.1)	-23.9 (11.2)
U.K. prices		13.3 (1.58)	-12.6 (1.93)
French income/Belgian income[1]		-2.46 (1.04)	-5.09 (1.91)
Belgian-French interest rates		-1.21 (6.07)	-1.02 (4.59)
Belgian-U.S. interest rates		0.73 (2.81)	0.44 (1.50)
Seasonal variable:	A1	-1.08 (3.82)	0.17 (0.79)
Trend		-0.11 (8.05)	-0.05 (2.85)
Speculative dummies:	BG1	2.14 (3.69)	1.26 (2.01)
	BG5	-4.10 (3.38)	-3.73 (2.82)
	BG8	-1.15 (2.13)	-0.79 (1.26)
	BG9	-1.54 (2.06)	-1.60 (1.96)
	F4	8.19 (10.0)	6.47 (6.91)
	F5	4.87 (8.39)	2.94 (4.01)
	F6	3.83 (3.50)	2.67 (2.20)
	F7	3.82 (5.27)	3.24 (4.02)
	F8	7.43 (10.6)	6.52 (8.04)
	F9	-0.50 (0.68)	-0.97 (1.18)
	F11	-1.56 (2.23)	-1.77 (1.93)
	F12	-4.12 (6.65)	-3.87 (4.74)
R-SQUARED		0.98	0.98
DURBIN-WATSON STATISTIC		1.31	1.34
STANDARD ERROR OF THE REGRESSION		0.99	1.08
F-STATISTIC		210.0	175.9

Notes: 1.   French and Belgian employment indices.

the significance of the French-U.S. differential in the belga-
dollar estimates. No ID's were significant which is perhaps more
likely to reflect the inadequacy of the sources used to derive these
variables (particularly the ones for the minor currencies) rather
than to indicate that intervention was unimportant.

There is also evidence of a clear seasonal effect and a long
run trend for the belga to weaken against the pound. Although
different combinations of seasonal variables were significant in
COL and WP versions, the indicated seasonal effect is very similar
with the belga tending to be weak against the pound in the middle of
the year (March-August) and to be strong at the turn of the year
(September-February). To a large extent this is in line with the
"traditional" seasonal pattern of the pound, more usually associated
with its exchange rate against the dollar, of autumnal weakness and
spring strength. The trend variable may reflect a combination of
increasing war scare on the continent and higher British productivity
growth. At any rate its performance is consistent with that in the
estimates of the pound's exchange rate with the franc and the dollar
(although not with the guilder and the Swiss franc, discussed below).

Two British speculative dummies are significant (and correctly
signed), K1 and K3, as they were in the pound-dollar estimates;
furthermore, their insignificance in the pound-franc equations was
satisfactorily explained in terms of mistiming (K1) and overlap with
a significant French speculative dummy of the same expected sign
(K3 with F3). Five of the nine Belgian dummies were significant
and one of the others, BG6, had been significant and correctly signed
in earlier estimates but became insignificant in the final estimates;
this may be interpreted as a very tentative indication that the final

collapse of the gold bloc (in autumn, 1936) did cause the belga
to weaken in sympathy. Two of the significant Belgian dummies are
incorrectly signed - BG3 and BG4 - which cover the period immediately
preceding the belga devaluation in March, 1935. The belga was under
pressure at this time and therefore these variables were postulated
to be associated with belga weakness; in retrospect, given that the
belga was on the gold standard, they should probably have been expected
to carry the "wrong" sign, showing belga strength, due effectively to
official intervention to keep the belga on the gold standard during
a period when it was under pressure (in part because "economic
fundamentals" suggested that it was overvalued). The sign and
significance of these two variables is therefore not surprising.
The insignificance of BG1, BG5 and BG7, as with all insignificant
speculative dummies, either suggests that the influences they represent
were unimportant or of very brief duration.

The belga-dollar results in Table 6.4B are rather striking:
they give very strong support to the hypothesis that exchange rates
were determined primarily by "economic fundamentals". The coefficients
of determination and Durbin-Watson statistics are high, there is strong
evidence of relative price[50] and relative income effects and only
five speculative dummies are significant which are either associated
with the period of U.S. dollar undervaluation in 1933-5 (S4, S5 and S6),
or with the propping up of the belga in the period immediately before
its devaluation in 1935 (BG3 and BG4), discussed above in connection
with the "wrong" signs of BG3 and BG4. Thus "economic fundamental"
effects predominate and principally bi-lateral ones at that, since
only the U.K. WP index is significant of the main third country
"economic" variables.

As in the belga-pound estimates the interest rate differential between the other country (the U.S., in this case) and France is significant and signed in such a way as to indicate that a rise in French interest rates caused the belga to strengthen (thereby supporting the idea of a belga-franc "psychological" link). The pound-dollar ID is also significant and, as might be expected, suggests that official support for the dollar against the pound caused it to appreciate against the belga. The significance of these latter two variables allied with the insignificance of their Belgian equivalents may indicate that it is the American "economic fundamentals" that are the most important component of the bi-lateral variables and hence that these dominated the belga-dollar exchange rate; this would seem to be quite plausible.

A comparatively large number of seasonal variables are significant (although they have the same sign and approximately the same values in both COL and WP versions). In fact the seasonal effect that emerges from adding them together is a rather simple one: the belga strengthened in the November to March period and weakened in April-October. This is virtually the opposite to what might be expected given the traditional tendency for the dollar to strengthen against European currencies during the crop-moving season (autumn). Nevertheless, the seasonal effect as described here is a significant one and is also a fairly smooth cycle and, moreover, it should be remembered, that it is virtually identical to, and hence perfectly consistent with, the belga's seasonal variation against the pound which may suggest that the explanation is of Belgian origin. The performance of the trend variable is also surprising: it suggests a tendency for the belga to appreciate against the dollar in the 1930's when a depreciation

(due to increasing war scare) might have been more reasonable. In conclusion, despite the unexpected direction of these effects, the belga-dollar estimates do, on balance provide a large measure of support for the model developed here.

To a large extent, this is also true of the belga-franc estimates. These are slightly different in that they relate to an "internal" gold bloc exchange rate and hence it may be expected that Belgian variables would be quite important. In fact, this turns out to be the case to the extent that these are the only belga exchange rate estimates in which Belgian interest rates are significant and also there are proportionately more Belgian speculative dummies significant than elsewhere. Once again there is strong evidence of a relative price effect and lesser evidence of a relative income effect but ROW effects are of only slight importance (U.K. prices). On the one hand, this is not surprising as this is an "internal" gold bloc exchange rate but, on the other, it is surprising that only one U.S. variable showed up - the Belgian-U.S. interest rate differential - and this is "wrongly" signed. However, whilst the scarcity of U.S. variables in Table 6.4C is perhaps unexpected, the "wrong" sign of the latter interest rate differential is not. This variable was "wrongly" signed in the preliminary belga-dollar estimates (and on one occasion significant at the 20% level) and the Belgian-U.K. differential was significant and "wrongly" signed in the belga-pound estimates where it was interpreted as indicating that a rise in Belgian interest rates was taken as a sign of Belgian weakness in the ROW. However, within the gold bloc itself, interest rate effects may have operated more conventionally as indicated by the correct sign of the highly significant Belgian-French interest rate differential.

There is no significant ID although to the extent that both
countries were on the gold standard for much of the time, intervention
must have taken place. The negative trend variable suggests a long
run tendency for the belga to strengthen against the franc (as well
as the dollar) and the single significant seasonal variable (A1)
indicates belga strength in September-March and weakness in May-July.
This is very similar to the seasonal movements of the belga against
the pound and the dollar.

A number of Belgian speculative dummies are significant although
two (BG6 and BG7) are inapplicable and three (BG2, BG3 and BG4) are
insignificant. The performance of these latter variables is a little
surprising: BG2, associated with belga strength, overlaps exactly
with F1 (therefore excluded), which is associated with franc weakness,
and hence might be expected to be significant for two sets of reasons.
However, F1 is insignificant in all French franc estimates (both in
this and the preceding chapter) whilst BG2 is insignificant in the
belga-dollar though not the belga-pound estimates, and, consequently,
it is possibly just a straightforward case of the influences represented
by BG2 (and F1) not being important. The failure of BG3 and BG4 is
taken up in the discussion of the residuals later on. Of the four
significant Belgian dummies, one (BG1) is correctly signed whilst
the other three (BG5, BG8 and BG9) are not; these "wrong" signs are
almost certainly due to the fact that the franc was also weak at these
times, obviously more so than the belga.

Two-thirds of the French speculative dummies are significant,
three of which - F9 (significant in earlier estimates), F11 and F12
are correctly signed. The other five are all "wrongly" signed: they
are expected to be associated with franc weakness but all appear to

be associated with franc strength against the belga. One of them
(F8) was "wrongly" signed in the pound-franc estimates (and insignificant
in the dollar-franc); this was interpreted as indicative of official
support for the franc, an explanation which can also be used here.
Unfortunately, it cannot be used for the other dummies because they
were found to be either insignificant (F4) or correctly signed (F5,
F6 and F7) in the estimates of the pound-dollar-franc triangle. A
plausible alternative may be found in terms of the "psychological"
link between the franc and the belga along the lines of "anything
that weakened the franc may have weakened the belga even more".

However, there is a more obvious explanation: three of these
variables cover periods in 1935 after March (when the belga was
devalued) and the other covers the first three months of 1936; it may
well be that the period April, 1935 - September, 1936 represented one
of belga undervaluation against the franc and that F8 (June-September,
1936) should also be interpreted in this light. An examination of the
residuals may be instructive in this connection. In the whole of the
April, 1935 - September, 1936 period there are only three months not
covered by these significant (and positive) French dummies - December,
1935 and April, May, 1936. If the belga were "undervalued" against
the franc in the 1935-6 period then large positive residuals might
be expected for these months; this is precisely what happens. Thus,
the argument that the "wrongly" signed French dummies indicate belga
"undervaluation" in this period begin to look very plausible.

In general the contents of Table 6.4 give strong support to
the model developed here. Before examining the guilder and Swiss
franc, however, two tasks remain: firstly, the performance of variables
appearing in more than one belga exchange rate should be examined to

test for consistency; and secondly, something might be said (very briefly) about the residuals. As far as "economic" variables are concerned, since no interest rate differential or ID appears in more than one equation there is little opportunity for inconsistency; furthermore the belga's seasonal pattern is virtually identical for all three exchange rates - weak in the middle and strong at the turn of the year - although different combinations of seasonal variables are involved in each case.

Only the trend variable appears to exhibit inconsistency with the belga apparently gradually weakening against the pound but strengthening against the dollar and franc. This is not entirely unacceptable but a similar trend of the belga against all other currencies might appear more plausible. The differences can be reconciled in that the pound tended to strengthen over time against both the dollar and the franc and a gradual weakening of the French franc might be expected (in view of its large depreciation in 1936-38) but the tendency for increasing belga strength against the dollar is less easy to explain, although it may simply represent a gradual change in tastes or some omitted variable (such as a gradual, relative increase in Belgian protectionism towards the U.S.) Turning to the speculative dummies there is no inconsistency since they either only appear in one final equation (BG1, BG2, BG5 and BG6) or in none (BG7) or in two but carry the same sign (BG3 and BG4) with the exception of BG8 and BG9 whose differences can be explained: they were associated with belga weakness (as expected) in the belga-pound equations but this was partly a sympathy movement with the franc and hence their association with belga strength against the franc was interpreted as indicating that the franc weakened comparatively more than the belga in these periods.

It is not proposed to examine the residuals in detail but
it might be useful to briefly discuss the larger ones. In the belga-
pound estimates there are only two periods of large residuals which
indicate belga weakness in the first half of 1932 and strength in
February-April, 1934. The former group can probably be explained
by the tendency of the pound to strengthen in spring, 1932 and the
latter possibly by a mistiming of K3 (or perhaps better an extension
since it is significant). The majority of the large residuals in
the belga-dollar estimates occur in the April, 1933 to April, 1935
period and can therefore mainly be explained in terms of S4, S5 and
S6 (which cover this period and are significant) being of constant
value and therefore of having to average out the effect of the dollar
undervaluation even though it was an uneven affair in practice; this
explanation was plausibly used to explain some of the residuals in the
pound-dollar-franc estimates.

This type of argument can probably also be used for some of the
residuals in the belga-franc estimates. In addition two residuals
(December, 1935 and April-May, 1936) have already been accounted for
above in terms of a belga undervaluation against the franc in 1935-36.
The other residuals of specific interest are those from November, 1934
to March, 1935 which are particularly large in the latter three months
and indicate unexplained belga strength. This would suggest that BG4
and possibly BG3 would be significant if they are included in the
regression. These two variables were significant and associated
with belga strength in the belga-pound and belga-dollar estimates.
Strictly speaking, this is the "wrong" sign but a plausible explanation
was that there was heavy official intervention taking place at this
time to keep the belga on the gold standard. Thus it seems that had

BG3 and BG4 been included in the final belga-franc equations they would have performed in a manner consistent with the other belga estimates.[51]

(IV)

On balance, the belga estimates seem to support the model; this is less true of the guilder estimates which are presented in Tables 6.5A - 6.5C. The guilder-dollar and guilder-franc results are reasonably supportive in terms of high R-squareds, significance of "economic fundamentals" and so on but the guilder-pound estimates are very poor: the COL ratio is significant but "wrongly" signed, the relative income variable is significant and "wrongly" signed in both versions and the regressions are serially correlated. These "wrong" signs are especially difficult to interpret; whilst insignificance can be taken as an indication that these variables had no effect, it is extremely difficult to provide precise reasons for actually perverse effects. Usually recourse has to be made to the existence of "distortions". Certainly there are two good candidates for this here: Dutch protectionism may be cited, especially in terms of retaliation against one of her two main trading partners, Britain, and also the intensity of the Dutch desire to remain on the gold standard and the technical ability to do so may have led the Dutch exchange rate to move in the opposite direction to that indicated by "economic fundamentals".

Thus it is possible that perverse effects actually did take place and there is some contemporary evidence to support this contention. The political difficulties of further deflation were becoming apparent

TABLE 6.5A[1]:   GUILDER-POUND FINAL ESTIMATES

VARIABLE	COL	WP
Constant	-7.13 (3.79)	3.43 (1.59)
U.K. prices/Dutch prices	6.28 (3.09)	-0.71 (0.40)
U.S. prices	0.20 (0.11)	-2.71 (1.67)
French prices	6.80 (12.5)	5.92 (12.6)
U.K. income/Dutch income[2]	1.65 (2.12)	1.85 (2.75)
U.S. income[3]	2.95 (4.14)	3.37 (3.21)
Seasonal variables: A1	-0.09 (1.94)	-0.07 (1.50)
B1	0.16 (2.44)	0.14 (2.07)
Trend	-0.04 (9.96)	-0.03 (7.51)
Speculative dummies: H1	0.55 (2.43)	0.41 (1.89)
H2	-0.16 (0.78)	-0.37 (2.05)
H3	-0.32 (1.57)	-0.12 (0.65)
K1	-0.71 (3.52)	-0.52 (2.77)
K3	-0.20 (0.98)	-0.46 (2.41)
R-SQUARED	0.89	0.89
DURBIN-WATSON STATISTIC	0.87	0.97
STANDARD ERROR OF THE REGRESSION	0.274	0.265
F-STATISTIC	43.4	47.0

Notes: 1.   T-statistics in brackets

2.   U.K. and Dutch employment indices.

3.   U.S. employment index.

TABLE 6.5B: GUILDER-DOLLAR FINAL ESTIMATES

VARIABLE	COL	WP
Constant	1.75 (2.82)	4.31 (7.76)
U.S. prices/Dutch prices	-1.79 (2.31)	-1.95 (6.43)
French prices	0.92 (3.70)	0.002 (0.01)
U.S. income/Dutch income [1]	-0.38 (2.24)	-0.39 (3.07)
U.K. income [2]	2.09 (2.36)	0.74 (1.14)
Dutch-U.S. interest rates	-0.05 (3.99)	-0.02 (2.60)
Seasonal variables: A2	0.02 (1.49)	0.02 (2.31)
Trend	-0.01 (7.48)	-0.01 (5.61)
Speculative dummies: H1	0.17 (2.43)	0.07 (1.19)
H2	-0.09 (1.58)	-0.12 (2.77)
S3	0.11 (2.03)	0.03 (0.69)
S4	-0.38 (6.38)	-0.32 (9.78)
S5	-0.57 (10.6)	-0.42 (15.5)
S6	-0.27 (5.64)	-0.18 (4.63)
S7	0.31 (5.24)	0.29 (6.15)
S8	0.17 (3.86)	0.10 (2.69)
S9	-0.03 (0.90)	-0.07 (2.33)
R-SQUARED	0.97	0.98
DURBIN-WATSON STATISTIC	1.64	1.92
STANDARD ERROR OF THE REGRESSION	0.078	0.063
F-STATISTIC	121.3	191.5

Notes: 1. U.S. and Dutch employment indices.

2. U.K. employment index.

TABLE 6.5C: GUILDER-FRANC FINAL ESTIMATES

VARIABLE		COL	WP
Constant		17.6 (14.6)	14.1 (11.1)
French prices/Dutch prices		-6.48 (22.3)	-4.99 (16.5)
U.K. prices		-0.64 (0.41)	-4.97 (5.04)
U.S. prices		-2.60 (2.46)	0.15 (0.18)
French income/Dutch income [1]		0.32 (0.98)	1.50 (4.56)
U.K. income [2]		1.65 (1.05)	3.97 (2.05)
Dutch-French interest rates		-0.12 (5.40)	-0.13 (6.03)
Dutch-U.S. interest rates		0.09 (2.98)	0.12 (4.40)
Seasonal variables:	A2	0.03 (1.19)	0.05 (2.29)
	B1	-0.09 (2.58)	0.04 (1.21)
Trend		-0.04 (9.54)	-0.05 (11.4)
Speculative dummies:	H3	0.16 (1.77)	0.09 (0.96)
	H7	-0.40 (2.41)	-0.53 (3.14)
	F5	-0.05 (0.49)	-0.13 (1.52)
	F7	0.20 (2.07)	0.28 (3.07)
	F8	0.99 (10.1)	0.92 (9.20)
	F9	0.60 (6.39)	0.76 (8.07)
	F10	0.93 (8.83)	1.21 (11.0)
	F11	0.90 (9.46)	0.98 (8.62)
	F12	-0.28 (2.65)	-0.06 (0.52)
R-SQUARED		0.99	0.99
DURBIN-WATSON STATISTIC		1.08	1.37
STANDARD ERROR OF THE REGRESSION		0.132	0.132
F-STATISTIC		704.2	696.3

Notes: 1.   French production index and Dutch employment index.

2.   U.K. employment index.

in Holland in autumn, 1934, so much so that prices were reported as rising[52] even though the guilder was actually appreciating against the pound at this time. Furthermore, trade flows between Britain and Holland in this period apparently moved in a somewhat perverse manner and in the opposite direction to that postulated in chapter four. Given relatively lower prices and income in Holland than in Britain, Dutch exports might be expected to hold up rather better than imports. In fact the opposite seems to have been the case: by 1934 Dutch imports had decreased to 62.7% of their 1931 value but exports had declined to an even lower level (42.4%); moreover, the ratio of imports to exports had also risen from 48% in 1931 to 71% in 1932, 83% in 1933 and 70% in 1934.[53]

To summarize then, there is some evidence to suggest that the model is not applicable to the guilder-pound exchange rate and that "perverse" effects are taking place. On the other hand, of course, these estimates are serially correlated which may indicate that the price and income ratios' significance is apparent rather than real. However, a re-estimation of the guilder-pound final equations using the Cochrane-Orcutt technique probably removed the serial correlation[54] and left these variables significant although at lower levels. Finally, it is possible that the guilder-pound exchange rate was, in a sense, a "residual" or "cross" rate with the guilder's level being decided in other exchange rate markets and the pound-guilder rate simply the consequence of this, kept at its "artificial" level by protection and a strong affinity for the gold standard (which perhaps amounts to the same thing as saying that the model does not "work" because of distortions).

The performances of the other variables in the guilder-pound final

equations are more easily explained. There is some indication of a significant ROW (particularly American) effect, a seasonal effect that indicates guilder strength in November-March and weakness in May-September which is similar to that of the belga against the pound and is approximately in line with the pound's "traditional" seasonal pattern and the negative trend would indicate a tendency for the guilder to appreciate against the pound. Two British speculative dummies are significant and correctly signed and three Dutch dummies are significant, two of which are incorrectly signed: H2 coincides with a set of large residuals in the belga-pound estimates which were interpreted as indicative of a mistiming (or rather extension of) K3 and a similar interpretation seems reasonable here to explain H2's "wrong" sign; H3 may be related to the perversely signed economic fundamentals since it overlaps with the period (autumn, 1934) in which Dutch prices were reported as rising which should have caused the guilder to weaken when in fact it strengthened.

In sharp contrast to those for the guilder-pound, the guilder-dollar estimates are highly supportive of the model and indeed are reminiscent of the belga-dollar estimates (which may indicate that the major exchange rate for the minor gold bloc currencies was against the dollar and their other exchange rates were to some extent pre-determined by this). There is clear evidence of the expected relative price and relative income effects and the bi-lateral (U.S.-Dutch) interest rate differential is significant and correctly signed; in addition, there is limited evidence of a ROW effect, a surprisingly volatile seasonal effect - guilder weakness in March-April and September-October, guilder strength in December-January and June-July - and, as in the guilder-pound estimates, a negative trend.

A number of speculative dummies are also significant, two of which are Dutch (H1 and H2) and were significant in the guilder-pound equations, and hence can presumably be interpreted as they were then, and seven of which are American. Three of these (S4, S5 and S6) represent the period of dollar undervaluation in 1933-35 and S3 is "wrongly" signed, as it was in the pound-dollar estimates, where a plausible explanation was provided. The others - S7, S8 and S9 - are all correctly signed as they were in the pound-dollar-franc estimates. In conclusion, the model developed here would seem to satisfactorily "explain" variations in the guilder-dollar exchange rate and the hypotheses embodied within it receive substantial support.

This is broadly true of the guilder-franc estimates also. There is some suspicion of serial correlation but re-estimates of the final equations using the Cochrane-Orcutt technique substantially raised the Durbin-Watson statistic without changing the signs or significance of most of the variables to any great extent.[55] Of the major "economic fundamentals" two - relative prices and the Dutch-French interest rate differential - are significant and correctly signed but there were problems with the relative income variable. The original version of this, involving Dutch and French employment indices, was insignificant and the variable in Table 6.5C is based on Dutch employment and French production indices. A similar problem was encountered with the franc-pound estimates (and will be met in the Swiss franc-French franc estimates below) where an explanation was sought in terms of distortions due to trade controls and government intervention. In the guilder estimates this "wrong" sign is not entirely surprising and a similar explanation to that given of the "wrong" signs of both price and income ratios in the guilder-pound estimates seems appropriate: distortions have

been created by Dutch protectionism and the strong affinity to the gold standard.

A number of ROW "economic" variables are significant in Table 6.5C. A problem arises with the Dutch-U.S. interest rate differential whose sign is inconsistent with that in the guilder-dollar estimates; the suggestion is that a rise in Dutch interest rates relative to U.S. rates caused the guilder to strengthen against the dollar but weaken against the franc. An explanation could be sought in terms of rises in Dutch interest rates being interpreted as strength in the U.S. and weakness in France but this is not tenable because the Dutch-French differential is significant and negatively signed. The performance of the seasonal variables is equally unsatisfactory; some of them do show up but there are differences between the COL and WP equations and, in fact, this exchange rate is one of the few for which no clear seasonal pattern emerges. The negative trend variable indicating gradual guilder appreciation is not surprising given the tendency for the franc to depreciate from 1936 onwards.

Finally, several speculative dummies are significant although, with the exception of H3, F5 and F12, they are "wrongly" signed. The only Dutch dummy in this category (H7), expected to be associated with Dutch weakness, can probably be explained in terms of it over-lapping with a French dummy representing French weakness, and con-sequently its "wrong" sign indicates that the French franc was even weaker. The "wrong" sign of F7 can also be plausibly explained: the (franc) strength it represents may have been due to official inter-vention to maintain the guilder-franc relationship, bearing in mind that both countries were on the gold standard.

However, the fact that F8, F9, F10 and F11 were associated with franc strength is difficult to interpret. The same difficulty was experienced in the pound-franc estimates and one possibility outlined there was that these variables coincided with the "Blum experiment" which, to the extent that it may have succeeded and improved economic conditions in France, could have led to an increase in confidence and hence franc strength. But this point of view appears an unlikely one to have been adopted by a country as steeped in gold standard orthodoxy as Holland. Fortunately an alternative explanation is available: the dummy preceding the September, 1936 devaluation (F8) can be interpreted as indicative of the presence of official intervention whilst the dummies after the devaluation (F9, F10, F11) could be due to the guilder depreciating by more than the franc, making the latter appear temporarily strong against the former. In fact, this turns out not to be the case but an equally valid argument would be that, even so, the franc had not depreciated enough (as is shown by the fact that it was to depreciate a great deal more in subsequent months) and hence, in a sense, was "overvalued" against the guilder in this period until it depreciated again in June, 1937, the end of the period covered by these "wrongly" signed dummies.

This completes the examination of individual guilder exchange rates. A brief look at the performance of variables appearing in estimates of more than one of them reveals one apparent inconsistency in the Dutch speculative dummies; this is provided by H3, apparently associated with guilder weakness against the franc (as expected) but strength against the pound. It may be that reactions on the continent to political disturbances (which is what H3 represents) were stronger than in Britain. On the other hand, H3 is only significant in one of

the two guilder-pound equations (and then only at the 20% level)
and these estimates are unreliable because of serial correlation;
consequently, the "wrong" sign and significance of H3 in the guilder-
pound estimates is perhaps best ignored.

As far as the other variables are concerned, an inconsistency
of the performance of the Dutch-U.S. interest rate differential in
the guilder-dollar and guilder-franc estimates has already been
mentioned and there is no obvious explanation for this. The most
likely one would seem to be that the choice of interest rate is
inappropriate and this is taken up again when a similar difficulty
arises in the Swiss estimates. Furthermore, there is no common
seasonal pattern as occurred in the belga estimates although this
may very well be less indicative of any inconsistency than of simply
suggesting that no particular seasonal pattern exists which is not
entirely surprising since none is expected. The trend variable is
significant and suggests gradual guilder appreciation against all
three major currencies and only one ID is ever significant.

Finally, a brief look at the large residuals for the guilder-
dollar and guilder-franc (but not the guilder-pound) estimates may be
useful. In the former case the majority of the large residuals (and
there were not that many) occur, as in the belga-dollar results, in
the 1933-35 dollar "undervaluation period" and are therefore almost
certainly caused by the averaging process of S4, S5 and S6 in their
(unsuccessful) attempt to completely pick up an uneven influence.
This averaging problem is also apparent in the guilder-franc residuals.
There is, in addition, a strong case for explaining some of the
residuals of the guilder estimates in terms of Dutch protectionism
and strong affinity for the gold standard.

In conclusion, the application of the model to the guilder
is not entirely successful. In particular, the guilder-pound
exchange rate does not seem to have been determined by "economic
fundamentals" or, to the extent that it was, these tended to behave
in a way which is lacking in theoretical foundation.[56] On the
other hand, this may be explained in terms of the distortions
created by Dutch retaliatory protection against British goods and
the strong Dutch desire to remain on the gold standard. Certainly,
the fluctuations of the guilder against the franc and, in particular,
the dollar seem to be reasonably well explained by the model. In
addition, the failure of the Dutch speculative dummies to show up very
well is supportive (in a negative sort of way) although it may equally
well suggest that events in a small country like Holland exerted little
speculative influence on its exchange rate.

The final equations of the three Swiss franc exchange rates
are given in Tables 6.6A-6.6C. The performance of the model is
rather better than it was for the guilder, if not quite as satisfactory
as for the belga. In the Swiss franc-pound estimates the relative
price variable is correctly signed (although insignificant in the
COL version) but the problem of a "wrongly" signed income ratio is
once again apparent. This seems to be a recurring anomaly and, in
the absence of any theoretical explanation (if the monetary approach
is discarded), it may well be the case that the choice of income proxy
is not a particularly good one; unfortunately, in the Swiss case, there
is only one proxy available (unemployment data) and consequently
alternatives cannot be tested. However, the Swiss-U.K. interest
rate differential is correctly signed and significant, although the
U.K.-U.S. differential is perversely signed, indicating that a rise

TABLE 6.6A[1]: SWISS FRANC–POUND FINAL ESTIMATES

VARIABLE		COL	WP
U.K. prices/Swiss prices		-4.67 (0.84)	-8.47 (2.26)
French prices		12.9 (4.28)	11.3 (4.66)
U.K. income/Swiss income[2]		20.2 (5.05)	23.1 (5.54)
French income		-9.75 (1.19)	-3.39 (0.74)
U.K.-U.S. interest rates		1.56 (4.53)	1.19 (3.56)
Swiss-U.K. interest rates		-1.41 (4.91)	-0.86 (3.19)
Swiss franc-pound ID		-1.48 (2.74)	-0.82 (1.58)
Seasonal variables:	B1	1.38 (5.30)	1.26 (5.48)
	B2	-0.68 (4.60)	-0.64 (4.77)
Trend		-0.03 (1.81)	-0.06 (3.39)
Speculative dummies:	SW3	-1.35 (2.48)	-0.70 (1.43)
	SW5	-1.32 (1.52)	-1.41 (1.80)
	SW6	-1.59 (1.82)	-1.40 (1.78)
	SW7	1.80 (2.04)	1.02 (1.25)
	SW10	-1.54 (2.35)	-1.12 (1.86)
	K1	-1.55 (2.02)	-1.07 (1.59)
	K2	1.52 (2.29)	1.09 (1.79)
	K3	-1.26 (2.85)	-0.64 (1.49)
R-SQUARED		0.92	0.93
DURBIN-WATSON STATISTIC		1.46	1.49
STANDARD ERROR OF THE REGRESSION		0.827	0.751
F-STATISTIC		43.9	54.9

Notes: 1. T-statistics in brackets.

2. U.K. employment index and Swiss unemployment index.

3. French employment index.

TABLE 6.6B: SWISS FRANC-DOLLAR FINAL ESTIMATES

VARIABLE	COL	WP
Constant	2.24 (0.89)	6.82 (7.32)
U.S. prices/Swiss prices	-4.27 (1.97)	-3.66 (5.59)
U.K. prices	3.67 (1.68)	2.41 (2.27)
French prices	4.36 (6.52)	1.65 (2.80)
U.S. income/Swiss income[1]	-0.24 (0.51)	-1.06 (2.33)
U.K.-U.S. interest rates	0.09 (1.71)	0.07 (2.03)
Pound-dollar ID	-0.04 (1.10)	-0.04 (1.60)
Seasonal variables: B2	-0.07 (2.17)	-0.04 (1.42)
Trend	-0.01 (2.86)	-0.01 (4.09)
Speculative dummies: SW3	0.20 (1.42)	0.22 (2.03)
S3	0.22 (1.76)	0.18 (1.85)
S4	-0.58 (4.67)	-0.63 (8.11)
S5	-0.93 (10.8)	-0.69 (10.3)
S6	-0.23 (1.97)	-0.01 (0.06)
S7	0.88 (5.73)	0.77 (5.99)
S8	0.42 (3.48)	0.23 (2.38)
S9	-0.45 (3.34)	-0.19 (1.77)
S10	-0.56 (3.13)	0.18 (0.11)
R-SQUARED	0.96	0.97
DURBIN-WATSON STATISTIC	1.45	1.71
STANDARD ERROR OR THE REGRESSION	0.191	0.155
F-STATISTIC	89.5	139.2

Notes: 1. U.S. employment index and Swiss unemployment index.

TABLE 6.6C: SWISS FRANC - FRENCH FRANC FINAL ESTIMATES

VARIABLE		COL	WP
Constant		23.5 (20.3)	21.7 (17.2)
French prices/Swiss prices		-2.96 (1.24)	-7.03 (4.78)
U.S. prices		-9.97 (4.24)	-3.56 (2.45)
French income/Swiss income[1]		7.76 (7.07)	6.25 (6.08)
U.S. income[2]		4.02 (7.08)	5.36 (8.93)
Swiss-U.K. interest rates		0.25 (4.93)	0.35 (8.58)
Pound-franc ID		-0.08 (2.08)	-0.10 (2.62)
Seasonal variable:	A2	-0.06 (1.54)	-0.03 (0.84)
Trend		-0.07 (18.8)	-0.07 (20.5)
Speculative dummies:	SW2	0.38 (2.12)	0.11 (0.64)
	SW10	-0.21 (1.13)	-0.40 (2.14)
	F3	0.42 (3.52)	0.37 (3.33)
	F5	-0.39 (2.81)	-0.54 (3.91)
	F6	-0.38 (1.50)	-0.70 (2.83)
	F7	-0.24 (1.40)	-0.17 (1.08)
	F8	0.72 (4.94)	0.90 (6.74)
	F9	1.93 (12.6)	2.05 (14.0)
	F10	2.79 (15.0)	3.03 (16.8)
	F11	2.90 (20.4)	2.70 (17.6)
R-SQUARED		0.99	0.99
DURBIN-WATSON STATISTIC		1.81	1.88
STANDARD ERROR OF THE REGRESSION		0.232	0.222
F-STATISTIC		712.1	778.7

Notes: 1.   French employment index and Swiss unemployment index.

2.   U.S. employment index.

in U.K. interest rates caused a depreciation in the pound. This
may also be due to inadequacy of data and, indeed, the choice of
the U.S. interest rate has already been criticised in the preceding
chapter. Two other ROW "economic fundamentals" are also significant.

The Swiss franc-pound ID is significant but "wrongly" signed
although whether this can be taken as showing that intervention was
unsuccessful in this exchange rate, in that it was not sufficiently
strong to overcome the factors that it was trying to offset, is perhaps
rather dubious. The variable only actually takes on a value in three
months and hence it is almost certainly not comprehensive enough to
adequately test for the presence of official intervention. A clear
seasonal pattern emerges with the Swiss franc strong against the
pound in December-April and weak in May-November. This is (almost)
in line with the "traditional" seasonal pattern of the pound and is
similar to that of the belga and the guilder against the pound;
furthermore, the Swiss franc strengthened during the winter tourist
season (in the first quarter) which is precisely what is expected.

The majority of the British speculative dummies are significant
and correctly signed. Half of the Swiss dummies are significant but
three are "wrongly" signed. In the cases of SW5 and SW6 this might
be explained by the fact that they cover two months in the six month
period preceding the Swiss franc depreciation in 1936 and, as the
franc was still on the gold standard, they may be picking up official
intervention which was necessary to keep it there. This inter-
pretation is borne out by an examination of the residuals: in the
four of the six months immediately preceding depreciation not covered
by dummy variables there are large negative residuals indicating that
the Swiss franc was stronger than predicted by the model. The same

explanation in reverse can be used for the "wrong" sign of SW7:
in the six months after leaving the gold standard the Swiss franc
was "undervalued" as is indicated by large positive residuals in
these months except for February, 1937, where the effect is picked
up by SW7.

The performance of the model in "explaining" the Swiss
franc-pound exchange rate is only adequate but for the Swiss franc-
dollar it is extremely good. There are significant and correctly
signed relative price and income effects and an important ROW effect.
Furthermore the two "third country" variables that could be expected
to have a given sign if their influence is to be plausible, do indeed
behave as expected: the U.K.-U.S. interest rate differential indicates
that an increase in the U.S. rate compared to the U.K. rate caused
the dollar to appreciate against the Swiss franc[57] and the pound-
dollar ID suggests that official support for the dollar against the
pound also caused it to appreciate against the Swiss franc. There
is a significant seasonal variable which suggests a seasonal variation
not dissimilar to that of the guilder-dollar exchange rate but the
fact that it involves two periods of strength and two of weakness
make it a rather unlikely seasonal pattern; however, as against the
pound, the Swiss franc does strengthen during the winter tourist
season (January-March). The negative trend is consistent with the
other Swiss exchange rates examined.

A number of (mainly American) speculative dummies are significant.
The single Swiss dummy is "wrongly" and, perhaps more important, in-
consistently signed, given its performance in Swiss franc-pound
estimates. However, an obvious explanation is at hand: SW3 covers
a sub-period of (the significant) S5 and its effect is therefore clearly

distorted due to overlapping of dummy variables. With one exception, the U.S. dummies are correctly signed or where they are not (S3) are also "wrongly" signed in other dollar exchange rates and this has been plausibly explained in the preceding chapter. The exception is S10 which represents dollar strength in late 1938. In retrospect, its inclusion was probably a mistake since not only was the Swiss franc reported to have moved in sympathy but a dummy variable included to capture this effect (and specifically excluded from the Swiss franc-dollar estimates), SW10, was significant and correctly signed for the other two Swiss exchange rates. S10's incorrect sign is therefore not surprising and, as it is only significant in the COL equation, probably not important.

As with the guilder, the degree of support given to the model by the Swiss franc-French franc results lies somewhere in between that provided by the Swiss franc-pound and Swiss franc-dollar estimates. There is evidence of a relative price effect[58] but the relative income variable is significant and "wrongly" signed. This appears to be a recurring problem as far as French "income" is concerned and it was suggested above that it may indicate more about the choice of income proxy than about any relative income effect. There is a ROW effect but once again the problem of inconsistent interest rate differentials emerges. In this case it is the Swiss-U.K. differential which, having indicated that a (relative) increase in the Swiss rate caused the Swiss franc to appreciate against the pound, suggests here that the same change led to a depreciation against the franc. It may be that rises in Swiss interest rates were treated as a sign of weakness within the gold bloc and led to a decline in confidence but this is tenuous and a more plausible explanation may be an inappropriate choice of

interest rate. Another significant ROW variable is the pound-franc ID which is plausibly signed: official support for the franc against the pound apparently caused it to strengthen against the Swiss franc.[59] There is very limited evidence of a rather strange (double peaked) seasonal effect which is probably best interpreted as indicative of no clear seasonal effect. The trend variable is once again negative and significant.

As with the Swiss franc-dollar estimates, the speculative dummies are mainly non-Swiss. Four of these, and the two significant Swiss dummies, are correctly signed but the other four - F8, F9, F10 and F11 - are not; they are unexpectedly associated with French franc strength. The same problem was encountered in the guilder-French franc estimates and the same explanation seems appropriate: F8 represents official support for the French franc and the other three suggest that in the period immediately following September, 1936 the franc was "overvalued" (and this was not corrected until 1937-8).

On balance, the Swiss franc seems to have fluctuated more or less in accordance with changes in "economic fundamentals" and a fair amount of support for the model is provided. Nevertheless, speculative effects are significant and although the contention that Switzerland, as a small country, would find that internal events which may have caused "speculation" would tend to be unimportant is borne out in the Swiss franc-dollar and Swiss franc-French franc estimates, the relatively large number of significant Swiss speculative dummies in the Swiss franc-pound estimates is rather surprising.

There is very little inconsistency of performance of any of the variables in different exchange rate estimates: there is evidence of

the expected seasonal pattern of the Swiss franc - strength in
the first quarter during the height of the winter tourist season -
in two of the   exchange rates, the trend was significant and
negative for all three and only one Swiss speculative dummy displayed
different signs for different exchange rates; this was SW3 and its
"wrong" sign was explained in terms of overlapping with another
speculative dummy (S5). Admittedly, there were problems with
interest rate variables, particularly the Swiss-U.K. differential,
but this has been encountered elsewhere and is perhaps best explained
in terms of the difficulties involved in selecting appropriate interest
rates and, indeed, by the fact that interest rate effects may have
been swamped and distorted by speculative effects.[60]

Finally, there were several clusters of large residuals in
each of the three Swiss exchange rates. In the Swiss franc-pound
estimates the majority of the residuals occur in the period immediately
preceding the abandonment of the gold standard in September, 1936 (and
have already been discussed above in the context of the performance
of the Swiss speculative dummies) or can be explained in terms of
mistiming of Swiss dummies, especially SW4 and SW8 (both of which are
insignificant). Obvious explanations of the residuals, with one
exception, also come to mind in the Swiss franc-dollar estimates.
These include the problem of averaging speculative dummies in the 1933-35
dollar undervaluation period (which seems to have affected most dollar
exchange rates), mistiming, or rather an extension of, S8 and, once
again, the fact that many of the residuals occurred in the periods
before and after the gold bloc collapse in September, 1936. This
factor can also be used to explain many of the residuals in the Swiss
franc-French franc estimates along with mistiming of some of the

speculative dummies (F2, SW1, SW4 and SW8), although it is not easy to rationally explain some of the others.

(V)

Before drawing some preliminary conclusions, reference should be made to an attempt to model speculative effects by use of a "speculative variable" (SV) based on forward exchange rate data instead of dummy variables. This could only be done for the three exchange rates involving the pound because of data limitations. The performance of an equivalent variable in the pound-dollar and pound-franc estimates led to pessimistic expectations about this exercise which turned out to be well founded: although the SV was significant with the correct (negative) sign in the belga-pound estimates, it was insignificant for the Swiss franc-pound and only significant in one out of the four guilder-pound equations, where it was "wrongly" signed. In view of this rather limited success, and in order to make the gold bloc results comparable to those for the pound-dollar-franc triangle, the use of "speculative variables" was not pursued.

In conclusion, the application of the model to the exchange rates of the minor gold bloc countries was undertaken with a certain amount of trepidation as these were clearly not freely floating exchange rates although all nine exchange rates were involved in a period of managed floating during part, and in some case most, of the 1930's. However, it was argued that the model should hold in a "permissive" sense to the extent that even these exchange rates could still not diverge too far from the path indicated by "economic fundamentals" if indeed "economic fundamentals" did determine exchange rates in this period.

In fact, this view turns out to be broadly supported by the
results. Only in the guilder-pound estimates was there no evidence
of a (correctly signed) relative price effect and for seven of the
nine exchange rates the relative price variable was significant (or
in two cases almost significant) at the 20 per cent level or higher
in both COL and WP versions. The relative income variable was less
successful although it was always significant and correctly signed
in exchange rates involving either the belga or the dollar. Moreover,
the   incorrect sign and significance in the Dutch and Swiss
exchange rates against the pound and French franc may raise more
questions about the choice of income proxy rather than the direction
of the relative income effect. The bi-lateral interest rate differentials
also performed tolerably well: they were correctly signed and signifi-
cant in half of the estimates and tended to be insignificant rather
than significant and "wrongly" signed in the rest. However, there
were some problems with the consistency of performance of third
country interest rate differentials but these were put down either
to plausible perverse effects - a rise in interest rates leading to
a decrease in confidence rather than attracting funds - and the problems
involved in choosing suitable interest rates. More generally, ROW
effects did seem to play a part in determining these exchange rates
as was expected.

One group of variables that did not show up very well was the
gold bloc official intervention dummies. Only the Swiss variable
was ever significant (in the Swiss franc-pound estimates) and then
it was wrongly signed. To interpret the failure of these variables
as suggesting that official intervention was ineffective is, however,
rather dangerous because they were constructed on the basis of very

limited and probably inadequate data[61] and consequently the
number of months in which they actually take on values is very
small.[62] Indeed, the more extensive pound-dollar and pound-franc
ID's are significant and plausibly signed on three occasions. There-
fore, a more reasonable assumption would be to say that no explicit
evidence of effective official intervention has been found but it is
not ruled out because of the probable inadequacy of the test.

This is not true of the seasonal and trend variables: there
is ample evidence to suggest that the belga tended to weaken in the
summer and strengthen at the turn of the year and that the Swiss franc
strengthened during the winter tourist season (as expected) in the
first quarter although the guilder's seasonal variation, if indeed
there was any, is less certain. The trend variable suggests that the
minor gold bloc currencies gradually strengthened (with the exception
of one exchange rate). This is rather surprising as the opposite
may have been expected due to increasing fear of war but at least
the performance of the trend is consistent across exchange rates.

A number of speculative variables were significant and those
of Belgium, Holland and Switzerland have been examined for consistency
in different exchange rates and possible explanations have been provided
for the (few) inconsistencies. It was anticipated that the potential
speculative influence of such small countries may be swamped by other
effects and not therefore be important. This was only clearly the
case for Holland although it was also true for Switzerland except
in the Swiss franc's exchange rate against the pound; however, the
Belgian dummies were apparently quite important. Nevertheless, the
U.K., U.S. and France did provide alot of significant dummies which
generally behaved in a manner consistent with their performance in

the pound-dollar-franc estimates.[63] All this would suggest

speculation did have a role in the determination of these exchange

rates, but not an exclusive one. In addition, it appears that the

belga may have been "undervalued" against the franc in the period

between the belga devaluation (March, 1935) and the French devaluation

(September, 1936), and that the franc may have been "overvalued" in

the October, 1936 - June 1937 period.

Finally, there was a clear order of exchange rates in terms of

the degree to which the model was supported: exchange rates involving

the dollar were "best" followed by those involving the French franc

and lastly, those with the pound. This may suggest that the principal

exchange rate for these countries was that with the dollar and, to

some extent, the rest simply followed. However, only one of the

pound exchange rates - against the guilder - actually failed to

provide any support for the hypothesis that exchange rates were

determined by "economic fundamentals", and in this case distortions

caused by Dutch protectionism and strong affinity for the gold standard

can plausibly be put forward as reasons for this. Indeed, these

results would seem to indicate that the degree of protection may

have played a role in determining exchange rates in the 1930's: the

"best" results in this chapter are provided by the belga, the currency

of a country where protection was half-hearted, and the worst are

those of the guilder, that of a country which pursued a vigorous

protectionist policy.

FOOTNOTES TO CHAPTER SIX

1. In a sense this is the correct procedure since logically
    no country can proxy the ROW and therefore all other countries,
    in principle, should actually be included in the model. In practice,
    this is obviously impossible (even in the absence of data
    deficiencies) since it would substantially reduce the degrees
    of freedom and almost certainly lead to multicollinearity. However,
    this is the extreme case; where there are only two fairly equal
    contenders for the choice of "third country" it may be sensible
    to include both.

2. Dr. Trip, Governor of the Dutch Central Bank, reported in the
    Economist, 10/10/36, p. 70. The same source indicates a curious
    change in debating positions in Holland at this time: those who
    formerly favoured guilder devaluation now wanted it to be fixed
    at a new (lower) level while those who had advocated maintaining
    the gold standard wanted the guilder to find its own level.

3. Statist, 26/3/38, pp. 453-4.

4. For example, it is argued in an article in Lloyds Bank Review in
    November, 1934, that Belgium "would gain by a stable relationship
    to the pound....This is realised in Belgium; and it is generally
    admitted that Belgium should have followed sterling when the
    Scandinavian countries did so". (pp. 478-9).

5. Economist, 16/1/32, p. 121. Examples of this would include the
    Ouchy Convention negotiated in 1932, the attempts to save the belga
    by expanding the internal trade of the gold bloc, the U.S.-Belgian
    trade treaty (1935), the immediate adherence to the Tripartite
    Agreement in 1936 and, perhaps most clearly, the attitude following
    the devaluation in March, 1935, when strenuous efforts were made
    to show that the devaluation was not a competitive one.

6. Economist, 13/2/32, Commercial and Financial Review of 1931, p. 18.

7. Economist, 17/2/34, Commercial History Review of 1933, p. 15.

8. Economist, 20/7/33, p. 20.

9. Economist, 6/10/34, p. 639.

10. Yeager, (1976), p. 358.

11. Statist, 16/11/35, International Banking Supplement, p. 10. The
    Banking problems were caused largely by the "mixed" nature of the
    banks' business. In the 1926-29 boom period, the banks had issued
    a large number of long term loans to industry as well as granting
    unsecured current account advances on a lavish scale. Consequently,
    when the depression came, the banks found both a drop in the market
    value of their industrial participations and that they had a large
    number of unrealizable assets which led to liquidity shortages and
    a fear of insolvency. Indeed, in March, 1934, the Banque Belge du
    Travail had to close its doors and this was the fate of numerous small
    banks (although the larger banks managed to survive).

12. This was reported in the Wall Street Journal, 26/3/35, and
    is referred to in Shepherd (1936).

13. There were also political disturbances in Belgium, in the
    shape of Rexist agitation in October, which may have decreased
    confidence and hence caused weakness.

14. Obviously this variable is not applicable to the belga-franc
    estimates.

15. See the Economist, 24/7/37, pp. 187-8.

16. Economist, 4/9/37, p. 478.

17. Economist, 12/3/38, p. 568. See also the Statist, 26/3/38, pp. 453-4.

18. Statist, 14/5/38, p. 733.

19. The Dutch unemployment rate was considerably higher than that of
    Belgium and Switzerland throughout the 1930's. It never fell
    below 20% after October, 1931.

20. Reported in the Economist, 17/10/31, p. 712.

21. Statist, 16/5/36, p. 803.

22. Economist, 11/11/33, p. 912.

23. Economist, 27/1/34, p. 174.

24. Economist, 11/3/33, p. 528.

25. Economist, 17/2/34, Commercial History and Review of 1933, p. 8.
    See also Lloyds Bank Review, June, 1933, p. 252: "Considerable
    nervousness has been felt during the month (May) lest Holland
    might be unable to maintain the gold standard".

26. R.I.I.A., Survey of International Affairs in 1933, p. 61.

27. See the Economist, 14/7/34, p. 61, 4/8/34, pp. 222-3, 25/8/34,
    pp. 356-7 and 22/9/34, pp. 536-7 for an account of these difficulties.

28. Lloyds Bank Review, June, 1935, p. 353.

29. Economist, 27/7/35, p. 171.

30. Yeager, (1976), p. 359.

31. Statist, 21/9/35, p. 386.

32. Statist, 6/6/36, p. 932. See also Lloyds Bank Review , July,
    1936, pp. 359-60.

33. Not surprisingly this step was taken with great reluctance. There
    was no panic in Holland after the French left the gold standard
    and, indeed, the initial reaction was to announce that Dutch
    monetary policy would remain unchanged. However, following the
    Swiss decision to leave the gold standard and an uncomfortably
    large gold outflow, this decision was reversed within twenty-
    four hours.

34. Economist, 26/9/31, p. 563.

35. Economist, 10/11/31, p. 664.

36. Economist, 14/1/33, p. 59.

37. Economist, 13/1/34, p. 70. See also Economist, 13/5/33, p. 1006, 20/5/35, p. 1067 and 1/7/33, p. 2, Lloyds Bank Review, July, 1935, p. 297 and R.I.I.A., Survey of International Affairs, 1933, p. 61.

38. Reported in the Economist, 27/10/34, p. 784.

39. Economist, 24/11/34, p. 980.

40. Economist, 6/4/35, p. 792. See also Economist, 20/4/35, p. 909: "Since the fall of the belga Switzerland has apparently become the weakest link in....the gold bloc".

41. This was because the two main forms in which Swiss banks held their assets were of dubious reliability; these were investments abroad, many of which were held in countries subject to transfer moratoria (mainly Germany), and mortgages and other long term advances, whose value depended very much on economic conditions and government policy.

42. R.I.I.A., Survey on International Affairs, 1934, p. 30. See ibid for more details.

43. Yeager (1976), p. 359.

44. Statist, 2/5/36, p. 714.

45. Lloyds Bank Review, July, 1936, pp. 359-60.

46. Lloyds Bank Review, March, 1937, p. 127.

47. Economist, 23/4/38, p. 194. See also Lloyds Bank Review, May, 1938, p. 240.

48. The only difference was that in the first stage estimates two variants of the two versions of each exchange rate were estimated, each using a different "third country". However, from the second stage onwards, these two variants were amalgamated and two countries (significant first stage variables only) were used to proxy the ROW.

49. This variable was significant and correctly signed in the pound-franc estimates.

50. The COL price ratio just fails to be significant at the 20% level. However, it was significant at this level in earlier estimates.

51. A re-examination of the first stage estimates showed that BG4 had been significant and had been excluded in error from later estimates.

52. See Economist, 25/8/34, p. 356-7 and 22/9/34, p. 536-7.

53. These figures are all based on data for the first nine months of each year given in the Economist, 10/11/34, p. 876. They are calculated from data on trade flows in value terms (in guilders). This is the relevant measure since it is the quantity of currency not goods crossing the frontier that is important. (In fact, not surprisingly, the trend described in the text is much accentuated if data in volume terms are used.)

54. The Durbin Watson statistics rose to 1.85 (COL) and 1.84 (WP).

55. The main effect was that a number of the speculative dummies became insignificant which tends to give more rather than less support to the principal hypothesis being tested here.

56. Of course, it should be remembered that the "wrong" sign and significance of the relative income variable in the guilder-pound estimates is supportive of the monetary approach to exchange rate determination. Nevertheless, it is also true that the monetary approach (and any other) would always suggest a negative relationship between the relative price variable and exchange rates (as they are constructed here).

57. The effect should not, however, be given too great a weight in view of the performance of the same variable in the Swiss franc-pound estimates and its insignificance in the pound-dollar-franc estimates.

58. The COL price ratio had been significant in earlier estimates.

59. In fact, it is not quite as straightforward as this. The pound-franc ID is insignificant in the pound-franc estimates and "wrongly" signed in the pound-dollar estimates which, in a sense, makes its performance in the Swiss franc-French franc estimates actually inconsistent. This matter is taken up in Chapter 8.

60. Fears of capital loss due to devaluation may completely override the attraction from any gain to be had from interest rate differentials particularly in the case of the gold bloc currencies.

61. The sources for the ID's for the three main currencies (pound-dollar-franc) are much more extensive and reliable.

62. The Belgian, Dutch and Swiss ID's actually take on a value in four, seven and four months (out of eighty-eight) respectively.

63. An examination of the U.K., U.S. and French dummies' performance for consistency across all the exchange rates they were included in will be carried out in Chapter 8.

CHAPTER 7

THE CANADIAN DOLLAR

(I)

Canada is rather different from the other countries included
in the study in a number of ways. Most obviously, it is the only
Empire country examined, mainly because it is the only member of the
Empire whose currency did not maintain a fairly rigid attachment to
the pound and can be said to have floated in some sense. The reason
for this was that Canada, unlike other Empire countries, had very
close links not only with Britain but also with the U.S.; indeed,
Canada is unique in that it maintained a very close relationship with
both the U.K. and U.S. simultaneously. The importance of these two
countries in Canadian economic affairs is made clear by considering
firstly, that Canada was a very open economy - approximately thirty
per cent of Canadian national income arose directly from external
sources[1] - and secondly, that in the 1930's the U.S. and U.K.
accounted for almost a half and a third, respectively, of Canadian
trade whilst the rest of the world accounted for barely a quarter,
as is shown by Table 7.1.[2] In fact, this rather underestimates

TABLE 7.1: PERCENTAGE SHARES OF TOTAL CANADIAN TRADE[3]

	1928			1935			1938		
	IMPORTS	EXPORTS	TOTAL TRADE	IMPORTS	EXPORTS	TOTAL TRADE	IMPORTS	EXPORTS	TOTAL TRADE
U.S.	67.6	37.1	51.5	56.7	37.3	45.6	62.6	32.9	46.1
U.K.	15.7	32.8	24.7	21.6	41.2	32.8	17.6	40.1	30.1
US+UK	83.3	69.9	76.2	78.3	78.5	78.4	80.2	73.0	76.2

the importance of Britain and the pound in a sense, since the
proportion of total Candian trade with the Empire as a whole was
rather larger than that with Britain itself, amount to 30.6% in 1931
and rising to 42.5% by 1936.[4]

In addition, Britain and the U.S. injected substantial amounts
of capital investment into Canada during this period: for example, the
value of U.S. assets accumulated in Canada reached $4,928 by 1930 and
stayed around this level throughout the decade and the comparable
figure for British assets held in Canada in this period was approx-
imately $2,700. There was also substantial Canadian investment in the
U.S. (though not so much in the U.K.) in the 1930's. This predominance
of two countries in Canadian economic affairs, in terms of both trade
and capital flows, clearly points to the two exchange rates which ought
to be examined and makes the choice of third country to proxy the
rest of the world equally obvious. Nevertheless, in spite of the
importance of the U.S. and U.K. for Canada, external factors should
not be emphasised to the point of totally excluding internal factors.

Even so, the course of the Canadian dollar in the 1930's does
largely reflect the dominance of these two countries, particularly
in the 1931-33 period. The Canadian dollar had left the gold standard
during WW1 and had returned (at the old parity) in July, 1926. In
early 1929, however, the exchange rate came under some pressure due
to deficits on both current and capital accounts and, in January, 1929,
the government abandoned the gold standard (de facto) by imposing an
informal embargo on the export of gold. Surprisingly, the Canadian
dollar did not drop to a substantial discount until October, 1929,[5]
when the Wall Street Crash meant that Canadians who had speculated
there had to transfer large amounts to cover previous purchases.

However, large (long term) capital inflows in 1930 pushed the Canadian dollar back to parity where it remained (more or less) until Britain left the gold standard in 1931.

Britain leaving gold created a problem for the Canadians. If the Canadian dollar were not depreciated with the pound then Canadian goods would become less competitive in a major export market.[6] On the other hand, if it were depreciated with the pound then, although it is true that this would have given Canadian exports a competitive edge in the U.S., any advantage was not only slight, since demand for the main export good (newsprint) was (price) inelastic, but overwhelmingly offset by the disadvantage of an increased debt burden and cost of debt servicing since this would now have to be paid in more expensive U.S. dollars;[7] this drawback was of great importance given the high level of Canadian indebtedness to the U.S. Caught between these two stools, Canada chose a middle path and the currency floated half-way between the depreciated pound and the American dollar until the U.S. left the gold standard in 1933:

> "On the whole, it was considered wiser to take the buffets
> from both sides rather than a knock-down blow from one". (8)

For a short time the Canadian dollar stayed half-way between the French franc (still on gold) and the depreciated dollar and pound but it then followed the former and from January, 1934, onwards, the Canadian dollar, U.S. dollar and pound all stayed fairly steady at slightly over 40 per cent below their pre-1931 gold parity until the outbreak of WW2 when the Canadian dollar dropped to a 10 per cent discount against the U.S. dollar.

(II)

In terms of the model developed here and the independent variables that are included, several other aspects of the Canadian economy in the 1930's also require some discussion. These include the degree of official intervention in the foreign exchange market, the roles of protection and relative price effects (which are obviously related) and the seasonal aspects of an economy heavily dependent on wheat exports. The first issue can be dealt with very quickly; with the exception of the government's deliberate currency inflation in late 1932, which was one of several factors which may have caused the currency to weaken in this period and is therefore represented by a speculative dummy, there seems to have been very little attempt to influence the course of the exchange rate. In the first half of the 1930's (before the Central Bank was set up in 1935):

> "Except for the above case, there was no attempt at
> control. The Minister of Finance announced that it was
> considered the best policy to allow the dollar to find
> its own level....The policy of drift was not regarded
> as satisfactory, but as the best thing possible in ...
> .. /the_/...circumstances". (9)

This policy seems to have continued even after the setting up of a

Central Bank and an exchange fund:

> "...there does not appear to be any clear evidence
> that the Bank of Canada, the last government, or the
> new Government which took office in November /1935/,
> have decided on any definite policy or any change
> from allowing the Canadian dollar.....to find its
> own level". (10)

More specifically:

> "The Canadian fund never operated at all....." (11)

In view of this evidence (or rather lack of it) no exchange fund dummy variable will be constructed for the Canadian dollar.

The role of relative prices in the determination of the
Canadian exchange rate needs to be discussed in particular detail
because there is some evidence to suggest that relative prices
were of little importance in determining Canadian trade flows.
The price inelasticity of American demand for Canadian newsprint
has already been mentioned and it seems plausible to argue that
European demand for Canadian wheat and flour was similarly inelastic.
More generally, the trends in Canadian exports in the 1931-33 period
have led some authors to conclude that it was income levels in
Canada's major customers rather than relative price effects through
changes in the level of the Canadian exchange rate that determined
Canadian exports.[12]   More formal (econometric) evidence is provided
by Thompson (1970) whose estimates of a Canadian export function
for the period 1926-38 produced insignificant price variables and
highly significant income variables. Thompson also estimates a
Canadian import function which produces better results for the
relative price variables but still finds that income fluctuations
were the predominant influence.

The existence of various protective measures, which is
particularly important in the Canadian case (and is discussed below),
would, of course, undermine relative price effects, particularly in
the import function, but whatever the reasons, the implications are
clear: relative income effects are more likely to be important in
the determination of the Canadian exchange rate. Fortunately, this
does not really undermine the model being tested here since it is
not completely wedded to the PPP hypothesis but rather stresses
"economic" factors in general, including income levels. In any
case there is some contemporary evidence to suggest that relative
prices did play some role in determining Canadian trade flows on

occasion and so they should not be completely dismissed at this stage.

The "frankly protectionist policy"[13] of the 1930-35 Conservative government requires further examination. In fact the Bennett administration was largely elected on the basis of his advocacy of protectionism as a panacea and received much of its support from the protectionist manufacturing sector (which it rewarded handsomely). Indeed, within two years of the Conservatives taking office the "Economist's" Canada correspondent was moved to comment:

> "We have reached the stage in Canada where a man ought to thank God every morning if no new industry has been born during the night, because every time a new Canadian industry is born it adds to the cost of living and increases the difficulty of doing business in Canada". (14)

However, the success achieved by this protectionism, in terms of steering Canada out of the depression, is rather doubtful.[15] Nevertheless, it was pursued by the Bennett government to the very end of its term of office and despite the policy of tariff reduction pursued by the Liberal government elected in 1935, protection remained at a high level in Canada throughout the 1930's; this must inevitably undermine the model used here.

Furthermore, any interpretation of the Canadian tariff is difficult because it was not just the height and coverage that was important, but the arbitrary and ungenerous way in which the tariff was interpreted by the Canadian authorities[16] and, in the present context, the use of special anti-dumping duties on imports from Britain. This was basically an extra duty aimed at counteracting the pound's depreciation and meant that imports from Britain were effectively

entering the country at an artificial exchange rate (higher than
the market rate). For a while, this effectively operative exchange
rate was £1 = $4.86⅔ (September, 1931 to late November, 1931) - in
other words the old par value - until it was reduced first to £1 =
$4.40 (late November, 1931 to March, 1933), then to £1 = $4.25 and
finally overtaken by events as the pound appreciated against the
Canadian dollar in 1933-34 when this arbitrary valuation was dropped.
An attempt was also made to impose a similar special anti-dumping
duty on American goods at the end of 1933 following the U.S.
depreciation but threats of retaliation by the U.S. led the
Canadians to drop this proposal except for a very small number of
goods.

The other important aspect of Canadian commercial policy
relates to Canada's trade agreements with other countries including,
of course, the Ottawa Agreements. Canada's policy towards trade
negotiations not surprisingly mirrored that on tariffs, being much
more generous after 1935. The effect of the Ottawa Agreements on
Canada's balance of payments with her two major trading partners
was to improve it in both cases. Canada's trade balance improved
with the U.K. because Canadian tariff concessions and interpretations
of tariffs were less generous than those of Britain.[17] The Ottawa
Agreements were also likely to improve the Canadian trade balance
with the U.S. since their objective was to encourage members of the
Empire to take each others' exports rather than those of third
countries but, in addition, the capital account improved as American
firms set up branch factories to circumvent the higher Canadian
tariffs.[18]

On returning to power in 1935, the Liberals set about reversing

the drift towards high protectionism and negotiated a commercial treaty with the U.S.[19] which cam into force in January, 1936. A new treaty with the U.K. followed in February, 1937 and, in late 1938, both these treaties were revised as the Liberal government continued its policy of freer trade.[20] However, despite this slight relaxation of Canada's protectionist stance, this management of trade must inevitably undermine the model developed here (insofar as there is no specific allowance for protection). In particular, the special dumping duties on Canadian imports from the U.K. in 1931-34 must create a distortion since the exchange rate being used for this portion of Canadian trade was not the market rate (the dependent variable here), although it did at least move in the same direction (in discrete steps). Since these duties were not applied to Canada-U.S. trade, the model in general (and the relative price variables in particular) might be expected to perform less well for the Canadian dollar-pound exchange rate than for that between the Canadian and U.S. dollars. Nevertheless, as suggested above, the high level of Canadian protection may also affect the application of the model to the latter and, for this reason, it seems desirable to explore the possibility of devising a "protection" variable.

Fortunately, in the Canadian case where the use of such a variable seems especially important, its construction (in a fairly crude form) would appear to be relatively easy, since the direction of influence of Canadian protection is fairly obvious, as are the turning points in Canadian commercial policy.[21] In fact, the "protection" variable takes the form of three dummy variables relating to Anglo-Canadian trade (TT1), American-Canadian trade (TT2) and a third simpler variable relating to either, which could

be used to replace TT1 and TT2. This latter variable carries a
value of zero during the highly protectionist, Conservative
government's period of office and one after the Liberals came to
power, reflecting the relaxation of protectionism following the change
in government in 1935.

TT1 and TT2 are more complex. The former will measure protective
influences which might be expected to create pressure on the Canadian
dollar to appreciate against the pound: from September, 1931, the
variable takes a value of one to reflect Canadian protective measures
(such as the anti-dumping duties) aimed at imports from Britain until
the Ottawa Agreements, after which it takes a value of two up to
the first Anglo-Canadian commercial treaty, since the effect of
Imperial Preference seemed to favour Canadian exports to the U.K.
more than vice-versa; finally, following the relaxation of Canadian
protectionism after the first Anglo-Canadian trade treaty, the variable
falls back to a value of one and then zero after the second Anglo-
Canadian treaty. The U.S.-Canada dummy (TT2) is rather simpler and
merely reflects the relaxation of Canadian protectionism (towards
the U.S.) after the first U.S.-Canada commercial treaty signed at
the end of 1935 (operative at the beginning of 1936). This might
be expected to work in favour of the U.S. and so TT2 should carry
the opposite sign to TT1. These Canadian trade policy dummies are
summarized in Table 7.2.

The final area of particular interest in the Canadian case
relates to seasonal factors. Given the importance of wheat in the
Canadian economy (particularly as an export) it might be expected
that there would be observable seasonal variations in the exchange
rate. In addition, foreign tourism played a fairly important role

TABLE 7.2: CANADIAN TRADE POLICY DUMMIES

VARIABLE	PERIOD ON	VALUE	EFFECT OF AN INCREASE ON CANADIAN DOLLAR
TT1 (U.K.-CANADA)	Sept. 31-Nov. 32	1	APPRECIATE
	Dec. 32-Feb. 37	2	
	Mar.-37-Nov. 38	1	
	Dec. 38	0	
TT2 (U.S.-CANADA)	Sept. 31-Dec. 35	0	DEPRECIATE
	Jan. 36-Dec. 38	1	
TT3 (BOTH)	Sept. 31-Oct. 35	0	DEPRECIATE
	Nov. 35-Dec. 38	1	

in the Canadian economy and this too was of a seasonal nature with the inflow of (mainly American) tourists reaching its height in the summer. The tendency of Canadian business conditions to vary in a seasonal (and fairly predictable) manner may also have influenced the exchange rate: there was a general lull in mid-winter (December-January), followed by a recovery in spring, some decline in mid-summer - "Business is experiencing its usual mid-summer torpor..."[22] - and an important improvement in the crop moving season - "The general autumn expansion..."[23] For these reasons, it might be expected that the Canadian dollar would tend to be strong in the summer due to tourism and also in the autumn when exports of wheat to Europe were at their height but weak at the turn of the year during the lull in business activity.[24]

(III)

Having examined the special factors in the Canadian case it now remains to take account of the speculative influences on the Canadian

exchange rate by constructing appropriate dummy variables. The
movements of the Canadian dollar in the 1930's have already been
summarized and what follows is an elaboration of this and a
chronological examination of the various speculative influences.
Some of these only apply to movements of the Canadian dollar against
the pound or the American dollar (when the Canadian dollar was moving
in sympathy with the other major currency) and will only be included
in the estimates for the appropriate exchange rate.

Although Britain's abandonment of the gold standard did cause
problems for Canada particularly in its relations with the U.S.
(discussed above), there appears to have been little to merit a
speculative dummy until the latter half of 1932 with one exception.
In the first quarter of 1932 the pound began to appreciate (having
dropped to a very low level in November-December, 1931). This trend
was, in part, due to speculative inflow of funds into Britain and
reached its height in March, 1932[25] at which point it seems to
have dragged the Canadian dollar along in sympathy:

> "During the past fortnight the Canadian dollar has
> strengthened considerably in New York...." [26]

This would suggest a first Canadian speculative dummy (for the
Canadian dollar-U.S. dollar exchange rate only) in March, 1932.

A number of influences then began to operate in the latter half
of 1932 and in early 1933. Initially, there was evidence of a modest
strengthening of the Canadian dollar against both the pound and the
U.S. dollar in August and September[27] although this may have been
partially seasonal. This tendency, however, was very quickly reversed
and the Canadian dollar entered a period of weakness in November which
lasted until January. This was partly an inevitable consequence of

the earlier strength but was aggravated by the government's decision "to embark on a deliberate policy of currency inflation"[28] when, on November, 1st, following the partial failure of an internal loan, the government borrowed $35 million from the banks. Despite the apparent unwillingness of the government to go any further than this these two factors, along with increased agitation for inflation in Canada (especially amongst Western prairie farmers), "inevitably aroused a feeling of alarm and caused heavy sales of Canadian dollars".[29]

The position then becomes confused. The "Economist" reports that:

"In the past fortnight the Canadian dollar has experienced a sharp decline in New York, and its fall is attributed partly to the pessimistic tone of Mr. Bennett's speeches and partly to the inflationist campaign which is still proceding vigorously". (30)

But on the other hand:

"....the American banking crisis in February-March 1933 did not spread to the Canadian banks. Funds flowed in from the United States to Canada for safety..." (31)

However, whilst the net effect of these two sets of factors on the Canadian dollar-U.S. dollar exchange rate in February is not clear, it does seem that the U.S. abandonment of the gold standard (and the burst of rapid depreciation that followed) did encourage the Canadian dollar to depreciate against the pound in March-June, 1933:

"...the sterling rate in Montreal has risen sharply" (32)

It would also seem likely that the second round of rapid U.S. dollar depreciation, following the adoption of Roosevelt's gold buying policy in November, 1933, may have triggered off another sympathy movement in the Canadian dollar against the pound.

A number of dummy variables would therefore seem to be required in the mid-1932 to mid-1934 period: for August-September, 1932, for November, 1932 to January, 1933, for March-June, 1933, and for November, 1933 to May 1934, with the latter two dummies only for use in the Canadian dollar-pound estimates since they represent sympathy movements of the Canadian dollar with the U.S. dollar. As far as February, 1933 is concerned, given the conflicting direction of the reported speculative effects, it seems prudent to include no dummy at all for this month. Throughout the rest of the 1930's the Canadian dollar moved fairly closely with both the pound and the dollar and there were no obvious periods of extreme pressure on the Canadian currency. However, in vitually every year there was a month or two in which there was some evidence of potential speculative influences on the exchange rate and so a number of further dummy variables will be created whose importance is perhaps less certain.

The year 1935 marks a watershed for Canada in that it ended with the general election in which the protectionist Conservative government was routed by the Liberal opposition. Not surprisingly there was a certain amount of political uncertainty and agitation throughout the year which may have led to doubts about the Canadian dollar: in May, there was considerable labour unrest with a docker's strike in Montreal and a serious riot in Vancouver; in June, the "Economist" was moved to comment: "There is no lack today in Canada of political unrest born of economic troubles";[33] in July, a new party was formed by the ex-Minister of Trade (Stevens) and this month also witnessed the rise of the inflationist Social Credit Party in Alberta; in August, the latter were elected into office in local elections. Whether all or part of this was sufficient to cause any

speculative pressure against the Canadian dollar is perhaps debateable but a dummy variable for the May to August period would seem worth trying.

In 1936 the Canadian dollar moved against the pound (according to contemporary sources) in sympathy with U.S. dollar on at least two occasions. Firstly, in the first two months of the year when the dollar weakened against the pound due to a variety of factors:

> "...the Canadian dollar has weakened on London in the company of its southern neighbour...." (34)

Then in October:

> "The Canadian dollar is following the American dollar in its appreciation against sterling". (35)

This tendency of the U.S. dollar to strengthen continued into November[36] and therefore it seems plausible to assume that the sympathy movement of the Canadian dollar did the same. Thus there will be two Canadian speculative dummies in 1936, both of which are for use in the Canadian dollar-pound estimates only.

Only one month in 1937 is worthy of a speculative dummy and this is July when an appreciation of the Canadian dollar probably occurred due to "hot money" flows from Europe. This would clearly affect the Canadian exchange rate against the pound but in addition, although the U.S. was also a recipient of these funds, it may have influenced the Canadian dollar-U.S. dollar relationship to the extent that Canada was receiving "hot money" from the U.S. also because of fears of its safety there due to industrial unrest and various rumours:

> "...there was...the influence of "hot money" flows from Europe, coming directly or via the New York markets..." (37)

"Stories have appeared in the Canadian papers that the
Government and the banks are worried about a steady
inflow of "hot money" on a large scale, due to the
fears of European investors who, having placed their
funds in the United States, have now become alarmed
about industrial troubles and the possibility of new
taxation directed against foreign investors". (38)

Finally, in autumn 1938, there were substantial capital move-
ments out of Europe to American because of fears of war. These have
already been discussed in the context of a potential strengthening
of the U.S. dollar against the pound and the franc (in Chapter 5). It
seems likely that the Canadian dollar may have strengthened against
the pound (but obviously not the U.S. dollar) for the same reason and
so a final Canadian dummy is created for the Canadian dollar-pound
estimates only. The Canadian speculative dummies are summarized in
Table 7.3.

TABLE 7.3:   CANADIAN SPECULATIVE DUMMIES

VARIABLE	PERIOD ON	TENDENCY OF C. DOLLAR	APPLICABLE TO	REASON
DC1	Mar. 1932	strong	US	Sympathy with pound.
DC2	Aug.-Sept. 1932	strong	US,UK	Inflow of capital.
DC3	Nov. 1932-Jan. 1933	weak	US,UK	Inflationary policy of government.
DC4	Mar.-June 1933	weak	UK	Sympathy with dollar.
DC5	Nov. 1933-May 1934	weak	UK	Sympathy with dollar.
DC6	May-Aug. 1935	weak	US,UK	Political unrest.
DC7	Jan-Feb. 1936	weak	UK	Sympathy with dollar.
DC8	Oct.-Nov. 1936	strong	UK	Sympathy with dollar.
DC9	July, 1937	strong	US,UK	Inflow of "hot money" from U.S. and Europe.
DC10	Sept.-Dec. 1938	strong	UK	Inflow of "hot money" from Europe due to war scare.

(IV)

The estimation of the C/P (Canadian dollar-pound) and C/D
(Canadian dollar-U.S. dollar) exchange rates followed the pattern
established for the pound-dollar-franc triangle. Two versions,using
WP's and COL indices respectively, were tried and, in the first instance,
employment indices proxied income and the "wide" version of the ID
(intervention dummy) was used. The Canadian, U.K. and U.S. speculative
dummies were checked for any close correspondence but the incidence
of overlap was either partial or the variables concerned carried
opposite expected signs;[39] consequently, no speculative dummies
had to be omitted on the grounds of overlap. The estimation proceded
in a number of stages with insignificant variables being omitted or,
where appropriate, replaced by alternative proxies. The final equations
are presented in Tables 7.4 and 7.5. In general the results are supportive
of the model (although this is more true of the C/D than the C/P estimates).
Many of the important variables are significant and plausibly signed,
the R-squared is high and there is no positive evidence of serial
correlation.

Examining the C/P equation in more detail would suggest ROW
effects had a very significant influence (which is not surprising given
the importance of the U.S. to the Canadian economy). U.S. "income"
and, to a lesser extent, prices are clearly important while the
significance and negative sign of the U.S.-U.K. interest rate differen-
tial would indicate that a fall in U.K. interest rates relative to
those in the U.S. caused the Canadian dollar to appreciate against
the pound. This is plausible in the sense that a decrease in U.K.
interest rates should lead to a depreciation of the pound in general
and, to the extent that the U.S. interest rate may have proxied the

TABLE 7.4: CANADIAN DOLLAR-POUND: FINAL ESTIMATES[1]

VARIABLE		COL	WP
Constant		8.42 (6.02)	6.87 (6.49)
U.K. prices/Canadian prices		-2.33 (1.38)	-1.08 (1.37)
U.S. prices		-2.73 (2.18)	-1.18 (1.27)
U.K. income/Canadian income[2]		-1.07 (0.87)	-2.28 (2.05)
U.S. income[3]		1.01 (3.95)	1.41 (2.95)
U.S. interest rate-U.K. interest rate		-0.20 (4.94)	-0.11 (3.52)
Seasonal variables:	A1	-0.06 (2.00)	-0.03 (1.37)
	B1	0.03 (1.50)	0.03 (1.61)
	B2	0.02 (1.38)	0.02 (1.32)
Trend		0.02 (7.07)	0.02 (7.12)
Speculative dummies:	K1	-0.28 (3.40)	-0.24 (2.88)
	K2	-0.34 (4.00)	-0.30 (3.16)
	DC2	-0.18 (1.97)	-0.23 (2.67)
	DC3	-0.48 (6.82)	-0.44 (5.83)
	DC4	-0.13 (1.80)	-0.11 (1.46)
	DC5	0.30 (6.15)	0.31 (6.24)
	DC7	0.14 (1.79)	0.19 (2.32)
	DC10	-0.25 (3.10)	-0.21 (2.75)
Protection dummies:	TT1	0.16 (4.06)	0.20 (6.70)
	TT2	-0.21 (4.15)	-0.24 (3.42)
R-SQUARED		0.95	0.95
DURBIN-WATSON STATISTIC		1.60	1.38
STANDARD ERROR OF THE REGRESSION		0.096	0.099
F-STATISTIC		73.0	68.5

Notes: 1.   T-statistics in brackets.

2.   U.K. unemployment index and Canadian employment index.

3.   U.S. employment index.

Canadian interest rate, even more so; indeed the insignificance of
this variable in the pound-dollar estimates would support this latter
interpretation. Finally the apparently greater importance of U.S.
incomes over U.S. prices is not surprising given the expectation
that incomes rather than prices were the major determinant of the
demand for Canadian exports.

The bi-lateral ratio variables perform less well. They are
all correctly signed but both the relative price variables (WP's and
COL indices) are only significant at low levels (20%) and the original
relative income variable based on employment indices was insignificant,
although when British employment index was replaced by the unemployment
index the variable did become significant in the WP version (as shown
in Table 7.4). This poor showing of relative prices is not unexpected
and the likelihood is that it is British prices that are unimportant,
and are causing the low levels of significance of the relative price
variable, because of the existence of a variety of Canadian protective
devices, discussed in Section II, which have undermined the expected
effect of changes in British prices on Canadian demand for British
imports (such as the artificially high exchange rate in 1931-33). This
hypothesis is supported by the performance of the price variables in
the C/D estimates where the Canada-U.S. price ratio is highly signifi-
cant (thereby suggesting that Canadian prices did influence Canadian
exchange rates) but U.K. prices are only significant at low levels.
Moreover, a comparable study of the Canadian dollar-pound-U.S. dollar
triangle which tested a similar model in non-ratio form found that
U.S. and Canadian prices tended to be significant but not British
prices.[40]

Unfortunately, the poor showing of the income ratio is less easy

to accept, particularly as it had been anticipated that relative incomes would play a major role since income levels in the U.K. seem largely to have determined the demand for Canadian exports (according to the evidence examined earlier). However, there is evidence to suggest that it is Canadian income that is unimportant not U.K. income: in the C/D estimates the U.K. employment index is significant (at the 1% level) and Ridpath found that the Canadian employment index carried the wrong sign in his initial estimates and was insignificant in his final equations.[41] The final major quanti- fiable independent variable, Canadian interest rates, could not be examined because of the lack of any data. Ridpath did manage to construct two series of Canadian three month interest rates based on proxies but found them of little importance.[42] This would indicate that their omission from the present study is of little consequence.

Of the non-quantifiable "economic" variables both the "narrow" and the "wide" versions of the pound-dollar ID were found to be insignificant[43] whilst the trend variable was significant and indicated a secular tendency for the pound to appreciate against the Canadian dollar. There is clear evidence of a seasonal effect with three significant variables. When these are combined it is quite obvious that Canadian wheat exports were the dominant influence on seasonal patterns in the C/P exchange rate (as expected) with the Canadian dollar tending to strengthen during the crop moving season in autumn (September-February) and weaken in the spring (March- August).[44]

The performance of the dummy variables representing changes in protection is difficult to interpret: both TT1 and TT2 are significant

(and consequently TT3 was not tried) but they carry the wrong signs. However, the signing of the protection variables was based on an examination of Canadian bi-lateral trade flows with the U.S. and U.K. which, in retrospect, may have been a fairly tenuous exercise since it involved the implicit assumption that such changes were due solely (or at least mainly) to changes in commercial policy; not only may this assumption be incorrect but it is also,to some extent, inconsistent with one of the main hypotheses of the model, that trade flows were determined by prices and incomes.[45] Perhaps the performance of TT1 and TT2 is best interpreted as providing a good example of the impossibility of adequately incorporating the effects of protection into the model, even in an apparently promising case.

Two of the British speculative dummies are significant but two are not (K3 and K4). K1 is correctly signed but the "wrong" sign of K2 is surprising; however, K2 overlaps with the significant DC3 and may be negatively signed for the same reasons (discussed below). Of the ten Canadian speculative dummies six are significant of which two are "wrongly" signed. The "wrong" sign and significance of DC3 is initially puzzling; however, a rational explanation may be found in terms of the Canadian dollar strengthening against the pound in sympathy with the U.S. dollar since the significance and sign in the pound-U.S. dollar estimates of an American speculative dummy (S3), which closely corresponds to DC3, indicated that the U.S. dollar did tend to strengthen against the pound in this period. Similarly the "wrong" sign of DC4, included to take account of expected Canadian dollar weakness in the period immediately after the U.S. left the gold standard in 1933, is difficult to explain. The most credible explanation

(and consequently TT3 was not tried) but they carry the wrong signs.
However, the signing of the protection variables was based on an
examination of Canadian bi-lateral trade flows with the U.S. and
U.K. which, in retrospect, may have been a fairly tenuous exercise
since it involved the implicit assumption that such changes were
due solely (or at least mainly) to changes in commercial policy;
not only may this assumption be incorrect but it is also,to some
extent, inconsistent with one of the main hypotheses of the model,
that trade flows were determined by prices and incomes.[45] Perhaps
the performance of TT1 and TT2 is best interpreted as providing a
good example of the impossibility of adequately incorporating the
effects of protection into the model, even in an apparently promising
case.

Two of the British speculative dummies are significant but two
are not (K3 and K4). K1 is correctly signed but the "wrong" sign
of K2 is surprising; however, K2 overlaps with the significant DC3
and may be negatively signed for the same reasons (discussed below).
Of the ten Canadian speculative dummies six are significant of which
two are "wrongly" signed. The "wrong" sign and significance of DC3
is initially puzzling; however, a rational explanation may be found
in terms of the Canadian dollar strengthening against the pound in
sympathy with the U.S. dollar since the significance and sign in the
pound-U.S. dollar estimates of an American speculative dummy (S3),
which closely corresponds to DC3, indicated that the U.S. dollar
did tend to strengthen against the pound in this period. Similarly
the "wrong" sign of DC4, included to take account of expected Canadian
dollar weakness in the period immediately after the U.S. left the gold
standard in 1933, is difficult to explain. The most credible explanation

would seem to lie in the possibility of (unreported) official inter-
vention by the British authorities to hold the pound down in order
to maintain some degree of competitiveness (with the U.S.) in the
Canadian market.

In conclusion, the performance of the model in representing
the influences that determined the C/P exchange rate is perhaps not
entirely satisfactory although, to a large extent, the problems were
correctly identified a priori (particularly with respect to relative
prices). However, the results did indicate some measure of support
for the model and the results of the C/D estimates (Table 7.5) are
highly supportive. There is clear evidence of both strong relative
income and (a little surprisingly) strong relative price effects.
In addition, the third country (U.K.) economic variables show up
well although the U.K.-U.S. interest rate differential is not
significant as it was in the C/P equations. (This would tend to
indicate more support for the argument, presented above, that U.S.
interest rates proxied Canadian interest rates to some extent).

There is also evidence of a seasonal effect with the Canadian
dollar tending to weaken against the U.S. dollar in the first half
of the year (January-June) but strengthen for the remainder (July-
December). As the effects of the crop moving season should have been
important in both Canada and the U.S.,the reason for the autumnal
strengthening of the Canadian dollar is not immediately obvious
although, given the comparatively much greater importance of wheat
in the Canadian economy, it may be that the tendency for the currency
to strengthen in the autumn was more marked in Canada. The strength
of the Canadian dollar against the U.S. dollar in the summer was
expected and is due to the influx of American tourists into Canada

which reached its height at this time. The negative trend variable would indicate a secular tendency for the Canadian dollar to appreciate vis-à-vis the U.S. dollar in the 1930's; there is no obvious reason for this. All three protection dummies (TT1, TT2 and TT3) were tried and found to be insignificant which would seem to reinforce the earlier conclusion (in connection with their performance in the C/P estimates) that this indicates the impossibility of adequately modelling protection.

Seven of the American speculative dummies were significant and three were not. The insignificance of S1 and S7 is not surprising given the poor performance of the former in estimates of other U.S. dollar exchange rates and the fact that the latter represents an inflow of "hot money" into the U.S. following the final collapse of the gold bloc; consequently, this influence may also have affected the Canadian dollar and, in any case, S7 clearly represents an effect that is really only applicable to U.S. dollar exchange rates against European currencies.[46] The final insignificant American dummy - S4 - represents the first phase of the undervaluation of the U.S. dollar in 1933; it may be that the Canadian dollar tended to move with the U.S. dollar in this first phase of depreciation but not in the second (and even more undervalued) phase after the U.S. gold buying in November, 1933.[47] It is certainly the case that the U.S. dollar appears to have been undervalued against the Canadian dollar in the November, 1933 to December, 1934 period as S5 was both significant and correctly signed.

Of the seven significant U.S. speculative dummies five are correctly signed (S2, S5, S8, S9 and S10). This is not inconsistent with their performance in estimates of other dollar exchange rates

TABLE 7.5: CANADIAN DOLLAR-U.S. DOLLAR: FINAL ESTIMATES[1]

VARIABLE		COL	WP
Constant		0.93 (6.13)	0.96 (5.42)
U.S. prices/Canadian prices		-0.46 (3.61)	-0.22 (3.56)
U.K. prices		0.28 (1.68)	-0.13 (1.51)
U.S. income/Canadian income [2]		-0.28 (4.74)	-0.34 (6.96)
U.K. income [3]		0.75 (4.09)	0.90 (4.09)
U.S. interest rate-U.K. interest rate		-0.003(0.87)	-0.004(1.10)
Seasonal variable:	A1	-0.02 (5.40)	-0.01 (4.02)
	B1	-0.02 (4.52)	-0.02 (6.46)
	B2	-0.004(1.83)	-0.003(1.14)
Trend		-0.004(7.42)	-0.004(6.68)
Speculative dummies:	S2	-0.05 (4.13)	-0.04 (3.77)
	S3	0.08 (7.11)	0.08 (7.07)
	S5	-0.08 (13.7)	-0.08 (16.4)
	S6	-0.03 (2.68)	-0.04 (4.22)
	S8	0.01 (0.95)	0.01 (1.49)
	S9	-0.02 (2.55)	-0.03 (2.87)
	S10	0.02 (1.19)	0.02 (1.55)
	DC1	-0.05 (2.99)	-0.04 (2.55)
	DC3	-0.06 (4.45)	-0.06 (4.23)
R-SQUARED		0.96	0.96
DURBIN-WATSON STATISTIC		1.82	1.93
STANDARD ERROR OF THE REGRESSION		0.014	0.014
F-STATISTIC		103.6	101.9

Notes: 1.   T-statistics in brackets.

2.   U.S. employment index and Canadian employment index.

3.   U.K. employment index.

and would therefore seem to require little comment other than to
note the clear indication that American speculative influences were
important in determining the C/D exchange rate. Moreover, the
incorrect signs of S3 and S6 were perhaps to be expected given their
performance elsewhere and possible reasons for their incorrect
sign were examined in detail in the discussion of the pound-U.S.
dollar estimates. It was concluded that the wrong sign of S6
represented a continuation of the U.S. dollar's undervaluation into
1935 and, less plausibly, that S3 reflected a combination of con-
fidence engendered by Roosevelt's victory in the Presidential election
and (or) unreported official support for the dollar. However, there
are complications relating to S3 in the Canadian context because of
its overlap with a Canadian dummy (DC3) which are discussed below.

Only five of the ten Canadian speculative dummies were applicable
to the U.S. and only two of these were significant. The insignificance
of DC6 and DC9 is consistent with the C/P estimates in which they
were also insignificant. Moreover, when the Canadian dummies were
constructed, there was some suspicion that the influences represented
by DC2 were seasonal and so this variable's insignificance is not too
surprising. DC1 was significant and represented a sympathy movement
with the pound in March, 1932. Its significance posed the question
as to whether a Canadian speculative dummy should also have been
included for the final quarter of 1931 to reflect potential sympathy
depreciation of the Canadian dollar with the pound and an examination
of the residuals suggests that such a movement probably did occur.
The final Canadian dummy, DC3, is significant and wrongly signed.

This is difficult to explain since a similar occurrence in
the C/P estimates had been interpreted in terms of a sympathy movement

with the U.S. dollar; therefore DC3 might have been expected to
be insignificant in the C/D equations. Furthermore, S3 (which covers
much the same period) carries the opposite sign to DC3; thus the
former is indicating a Canadian dollar appreciation and the latter
an appreciation at (approximately) the same time. A rather complicated
explanation in terms of a longer term tendency for U.S. dollar appre-
ciation in the November, 1932-March, 1933 period (picked up by S3)
containing a sub-period, November, 1932-January, 1933 (picked up
by DC3), in which there was a panic flow of American capital into
neighbouring Canada because of Roosevelt's election, thereby causing
a Canadian dollar appreciation (U.S. dollar depreciation) is possible,
but unlikely. A more plausible explanation may lie in the three month
overlap between the two variables (the three month DC3 fits into the
five month S3) and it may be that this is causing the rather odd
result and that this overlap should have been considered sufficiently
large to merit the exclusion of one of these two variables.

(V)

This completes the analysis of the Canadian dollar. Before
drawing some general conclusions something should be said about con-
sistency of performance of the variables in the two Canadian exchange
rates examined. This has already been referred to in numerous cases
and, in fact, there are not many cases where inconsistency could arise
(especially since half of the Canadian speculative dummies were not
applicable to the C/D exchange rate). Of the four Canadian speculative
dummies that appeared in the estimates of both exchange rates, three
were insignificant in both and the other was significant and carried
the same sign (albeit the "wrong" one). There were a few other variables

appearing in both exchange rate equations which could have displayed
inconsistency but, in the event, none of them did: the third country
interest rate differential was significant in the C/P and not the C/D
estimates but this was interpreted as perhaps indicating that Canadian
and U.S. interest rates moved together and so the latter proxied the
former, and third country official intervention appeared to have no
effect on either Canadian exchange rate.

Besides considering the possibility of inconsistency it would
be instructive to examine the residuals. This was done and revealed
eleven clusters of large residuals for each of the two Canadian dollar
exchange rates and these are listed in Table 7.6. Explanations of

TABLE 7.6: CANADIAN DOLLAR RESIDUALS[48]

CANADIAN DOLLAR-POUND		CANADIAN DOLLAR-U.S. DOLLAR	
Period	Sign	Period	Sign
July 1932	-	Nov. 1931	-
Sept.-Oct. 1932	-	Dec. 1931-Jan. 1932	+
Dec. 1932	-	April 1932	-
Feb. 1933	-	May-Aug. 1932	+
April 1933	-	April-May 1933	+
May-Oct. 1933	+	June-Oct. 1933	-
Oct.-Dec. 1934	+	Jan. 1935	-
Mar.-April 1936	+	May-July 1935	-
Oct. 1936-Feb. 1937	-	Sept. 1935	+
Feb. 1938	+	July-Oct. 1936	+
July-Aug. 1938	-	Oct. 1937	+

varying degrees of plausibility can be provided for most of these
residuals, mainly in terms of mistiming or extensions of speculative
dummies and the difficulties involved in trying to use constant value
dummy variables to pick up uneven effects.

Approximately half the C/P residuals can be explained by
mistiming[49] of Canadian speculative dummies: an extension of DC2
would have removed the July and September-October, 1932 residuals
and similarly extensions of DC7 and DC10 would account for the March-
April, 1936 and July-August, 1938 residuals; also the October, 1936-
February, 1937 residuals could be caused by a mistiming of DC8 (which
would explain its insignificance in the final estimates). A number
of other residuals would seem to be related to the U.S. dollar
depreciation and undervaluation in 1933-34. DC5 was significant
indicating a sympathy depreciation of the Canadian dollar with the
U.S. dollar and the May-October, 1933 residuals would seem to provide
further evidence of this. Furthermore, it was suggested in the examina-
tion of the pound-dollar-franc triangle that the U.S. dollar depreciation
was an uneven affair and the April, 1933 and October-December, 1934
residuals here would seem to bear this out. Similarly, the December,
1932 and February, 1933 residuals quite clearly suggest that the
significant (and negatively signed) DC3 is inadequately picking up
an uneven effect. Finally, there is no obvious explanation for the
February, 1938 residuals.

Similar explanations for most of the residuals in the C/D
estimates are possible. Mistiming of S1, DC6 and S8 would seem to
explain the residuals in November, 1931, September, 1935 and July-
October, 1936 respectively. An identical mistiming of S1 with dollar
weakness occurring not in October, 1931 (as S1 supposes) but in November

was discovered in the examination of the pound-dollar-franc residuals (in Chapter 5). Two other sets of residuals were also similar to those in the pound-dollar-franc estimates: the negative January, 1935 residual once again indicates the continuation of the U.S. dollar devaluation into 1935 and that January, 1935 is possibly more properly considered as part of S5 rather than S6, and the May-July, 1935 residuals suggest continued dollar undervaluation well into 1935. Moreover, the April and May-October, 1933 residuals, allied with the insignificance of S4, may also be caused by the U.S. dollar undervaluation, in that it was an uneven affair that cannot be adequately handled by a constant value dummy variable. Finally, the December, 1931-January, 1932 residuals may reflect a U.S. dollar recovery (following its November weakness) or a sympathy weakening with the pound whilst the April, 1932 residual almost certainly reflects a sympathy strengthening with the pound (and an extension of DC1). This leaves two sets of large residuals - May-August, 1932 and October, 1937 - for which there is no obvious explanation. Thus, it is possible to adequately explain most of the large residuals in the Canadian dollar exchange rates.

Moreover, in general terms it would seem that the model developed here and the hypotheses embodied within it, largely explain the fluctuations of the Canadian dollar in the 1930's, particularly against the U.S. dollar. There were some problems with the relative price variables in the C/P estimates but these had been anticipated. The expected seasonal effects materialised and there was some evidence of an important speculative effect as indicated by the significance of a number of (particularly the American) speculative dummies.[50] The significance of the third country variables (proxying the ROW) bears

out the contention that the Canadian economy was heavily influenced by events in two countries, the U.K. and U.S. Finally, the major disappointment was the performance of the protection dummies which were, at best, insignificant and, at worst, wrongly signed; however, it was concluded that these problems were more likely to be due to the methodology of these variables' construction rather than to any actual perverse "protection effects".

FOOTNOTES TO CHAPTER 7

1. Marcus (1954) p. 2. Also Hodson (1938) talks of "Canada's....
   peculiar dependence upon wheat exports".(p. 286.)

2. Of course trade was much reduced in 1935 and 1938 compared with
   1928. In value terms Canadian trade flows in 1935 were only 30%
   of their 1928 value and by 1938 had only risen to 38% (although
   the decline in volume terms was not so great). A further change,
   which is made clear by Table 7.1, is the increase in trade with
   the U.K. (as a proportion of total Canadian trade) in 1935; this
   presumably reflects the impact of the Ottawa Agreements.

3. Calculated from the League of Nations' "Network of World Trade".
   Canada accounted for a much smaller proportion of U.S. and U.K.
   trade, 15% and 5-7% approximately.

4. Calculated from Marcus (1954), pp. 25-6.

5. The average discount against the U.S. dollar in January-September,
   1929 was less than 1%.

6. In practice, this problem was aggravated by the fact that two of
   the three rival producers (Australia and Argentina) of the main
   product in question (wheat) did depreciate their currencies by
   more than the Canadian dollar. On the other hand, Canada did not
   suffer too much from the increase in competitiveness of British
   exports to Canada (caused by the fact that the pound depreciated
   by more than the Canadian dollar) because of the imposition of
   special "anti-dumping" duties (discussed below).

7. Much of the Canadian debt incurred in the U.S. contained clauses
   giving the creditors the choice of currency in which the debt was
   to be repaid and serviced. The American creditor would obviously
   choose the U.S. dollar in preference to a depreciated Canadian dollar.

8. Economist, 18/1/36, Special Review of Canada, p. 47.

9. Ibid. p. 47.

10. Ibid. p. 48. See also Ridpath (1975), especially pp. 333-4, and
    A.F.W. Plumptre: "Exchange Rate Policy: Experience with Canada's
    Floating Rate" (Princeton Essay in International Finance, No. 81,
    June, 1970).

11. Whitaker and Hudgins (1976), p. 1479, n. 7.

12. See Marcus (1954) p. 107 and Safarian (1959) p. 72.

13. Safarian (1959) p. 56.

14. Economist, 2/9/32 p. 13.

15. For example, Marcus (1954), p. 110, states: "As for the resulting
    effects on the cyclical course of the Canadian economy it is doubtful
    if the tariff and other protective measures had any important effect".
    See also Safarian (1959) pp. 56-7 and Brecher (1957) Ch. XI.

16. An example of this would be the long running and ultimately unsuccessful attempts of British woollen producers to get the tariff on their products reduced which are reported in various issues of the Economist (1934-35). The Canadian Tariff Board's final report - see Economist 6/4/35 p. 788 - more or less justified the existing tariffs and only made some slight cuts on woollen fabrics.

17. It was also due to the comparatively earlier and stronger recovery in the U.K. which meant that British import demand held up better than Canadian demand for imports.

18. This trend was also encouraged, in the September, 1931-April, 1933 period, by the fact that the Canadian dollar was depreciated against the U.S. dollar.

19. There was also a demand for this treaty on the American side. The U.S. Secretary of State, Cordell Hull, had been engaged in a policy of negotiating bi-lateral trade treaties for some time.

20. During the same period the commercial treaties with New Zealand and Australia were revised (October, 1937) and, following a minor trade war, Japan (December, 1935).

21. Canada is therefore a special case where some kind of plausible "protection" variable can be constructed. However, in general, the problems outlined in Chapter 4, Section III, make such an exercise impossible.

22. Economist, 17/6/35, p. 328.

23. Lloyds Bank Review, December, 1936, p. 621.

24. For example, the Economist, 4/2/33, p. 231, talks about "the development last month (January) of a certain seasonal weakness in the (Canadian) dollar...." This would suggest that the implicit assumption of the analysis here - that business activity decreased because of a decrease in foreign demand for Canadian goods - is correct. If it were due, instead, to a fall in Canadian demand then this would presumably also affect Canadian demand for imports and the Canadian dollar would strengthen.

25. This is discussed in more detail and in relation to the construction of the British speculative dummies in Chapter 5.

26. Economist, 5/4/32, p. 519.

27. Statist, 12/11/32, p. 614.

28. Economist, 3/12/32, p. 1033.

29. Economist, 4/2/33, p. 231.

30. Economist, 25/2/33, p. 412.

31. Marcus, (1954), p. 202.

32. Economist, 1/4/33, p. 692.

33. Economist, 29/6/35, p. 1433.

34. Economist, 8/2/36, p. 308.

35. Economist, 17/10/36, p. 118.

36. Indeed it was felt necessary to construct an American speculative dummy (S7) for October-November, 1936 to reflect this tendency of the U.S. dollar.

37. Marcus, (1954), pp. 159-60.

38. Economist, 24/7/37, p. 183.

39. The overlapping variables were as follows (with the expected signs of the variables in brackets): for the C/P relationship there was a partial (one month) overlap between DC3(+) and K2(+) and between DC5(+) and K3(-) and, in addition, K4(-) fitted into DC6(+); for the C/D DC6(+) and S6(+) overlapped partially (two months) and DC3(+) fitted S3(-).

40. See Ridpath (1975) pp. 145-6 and p. 149. This study applies the same basic model to the C/P and C/D exchange rates although there are important differences. Unfortunately it was only discovered at a very late stage in the writing of Chapter 7 of the present study and therefore had little influence on it. However, Ridpath's results are referred to wherever they are of interest in terms of either supporting or contradicting those of the present study.

41. Ibid, p. 115 and pp. 145-6 respectively. It should be pointed out that Ridpath also found that the British employment index tended to be insignificant although this may have been due to multi-collinearity between income and money supply variables since Ridpath included the latter in his regressions (unlike the present study).

42. Ibid. See Tables D7(a) and D7(b), pp. 363-4, for the interest rate data and pp. 145-6 for their performance in the final equations.

43. This is very much in line with Ridpath's results. See especially pp. 137-140.

44. The results of Ridpath's study would support this. He uses dummy variables to capture seasonal effects and in his C/P final equation (p. 145) he finds one seasonal dummy, S3, which covers September-November, is significant and negative, indicating that the Canadian dollar strengthened against the pound in this period.

45. Furthermore, the belief that the relaxation of Canadian protection embodied in the Canada-U.S. commercial treaty of 1935 would tend to increase Canadian demand for U.S. exports proportionately more than U.S. demand for Canadian exports, expressed above, may have been false even though it is true that: "During the 1930's Canada experienced....a growing net debit current balance of payments with the U.S." (Ridpath, 1975, p. 53). It could be argued that this was due to other factors and that changes in protection were working in the opposite direction as the "wrong" sign of TT2 suggests.

46. Indeed it was felt necessary to include a Canadian speculative dummy (DC8) in the C/P estimates to allow for a sympathy movement with the U.S. dollar (of the Canadian dollar) at this time.

47. Unfortunately there are some difficulties attached to this interpretation because a Canadian dummy (DC4) included in the C/P estimates, which was intended to reflect a sympathy depreciation of the Canadian dollar, carried the wrong sign indicating that the Canadian dollar tended to appreciate against the pound (whilst the U.S. dollar depreciated as indicated by the correct sign and significance of S4 in the pound-U.S. dollar estimates). However, it may be possible to reconcile this apparent conflict by recognising that DC4 and S4 cover different periods, March-June, 1933 and April-October, 1933 respectively, and it could be that the Canadian dollar tended to move with the U.S. dollar after a lag, thereby appreciating in the March-June period but depreciating with the U.S. dollar thereafter; this could explain the insignificance of S4.

48. A negative residual implies that the actual Canadian dollar was stronger than that predicted by the model and hence indicates the presence of unexplained Canadian dollar strength. Conversely positive residuals imply unexplained Canadian dollar weakness.

49. Either in the sense of speculative dummies being insignificant because they are constructed for the wrong months or in the sense of significant dummies that should have been extended.

50. It was not possible to construct a "blanket" speculative variable based on forward exchange rates and interest rates because of lack of data.

CHAPTER 8

PRELIMINARY CONCLUSIONS

(I)

The last three chapters have attempted to test the hypothesis
that exchange rates were relatively "stable" (or at least not violently
"unstable") in the sense of being determined by "economic fundamentals"
for fourteen bi-lateral exchange rates (involving seven currencies)
which can be said to have been "floating" in some sense for part, if
not most, of the 1930's. From the onset it was clear that, in addition,
speculative influences probably played some role and so these were
explicitly modelled and therefore the test is also, in a fairly
crude way, for the presence of "instability" as well. The purpose
of the present chapter is principally to examine the performance of
the different variables across all the exchange rates in which they
were included to discover to what extent (if any) a given variable
can be said to appear to have determined bi-lateral exchange rates
generally and to look for consistency of performance of variables
in estimates of different exchange rates.

The model used has been presented, on occasion, as an extended
PPP hypothesis and it is encouraging (though not surprising given the
results of comparable studies) to discover that relative prices stand
out as the most important individual independent variable in the study.
In all but one of the fourteen sets of estimates there is evidence of
a significant and correctly signed relative price effect and in over
half the price ratio is significant at the 5% level or less in both
the WP and COL versions of the tests. The only "wrongly" signed

and significant price ratio occurs in the COL version of the
guilder-pound estimates and a rational explanation was provided
in terms of retaliatory Dutch protection and the strong Dutch
affinity for remaining on the gold standard even during sub-periods
of 1931-36 when prices were actually rising.

In general, as was expected, the WP index is the "best" price
index with relative prices in the WP versions being significant at
the 1% level and correctly signed in eleven out of the fourteen
equations and only actually failing to be significant at the 20%
level or less in one case (the guilder-pound) where the variable is
at least correctly signed. Given that WP indices are dominated by
traded goods, doubts were expressed (in chapter two) about the
validity of any tests based on WP's and an extreme view would be
that interpreting their performance here as supportive of PPP only
compounds the mistakes of earlier authors who have mainly tended to
use this type of index.

However, whilst it is true that COL indices generally perform
less well, they are still significant and correctly signed for half
the exchange rates at the 5% level or less (and at the 1% level in
two legs of the pound-dollar-franc triangle) and are significant at
the 20% level or less in nine of the fourteen exchange rates; in the
other five, they are almost significant at the 20% level (and were in
some of the earlier stage estimates) for two exchange rates and in one
case (the pound-dollar) another largely non-traded goods-based index
(wages) was significant and correctly signed at the 1% level. There
is therefore overwhelming evidence of a short run bi-lateral relative
price effect in the 1930's. This would seem to indicate some support
for the PPP hypothesis and furthermore, the short run nature of the

relative price effect highlighted does not, of course, preclude
a longer term, more "traditional" PPP relationship.

Unfortunately, two other "economic fundamentals" - relative
incomes and interest rate differentials - were less successful
although it should be remembered that problems were always likely
as these variables are based on proxies. The relative income variable
is always significant in at least one version of each exchange rate
but for five of the fourteen exchange rates it is "wrongly" signed.
Whilst this could be optimistically interpreted as indicating the
existence of the expected relative income effect for two-thirds of
the exchange rates the "wrong" signs require some comment.

One possibility is to invoke the monetary approach to exchange
rate determination: instead of people reacting to an increase in
income by buying more goods, including imports (the "traditional"
approach), they attempt to hold more money, some of which they
obtain from abroad by selling more goods (increasing exports). If
the income ratio were always "wrongly" signed this might be satisfactory
but it is not. However, it is possible to argue that at different times
in different places the reaction to an increase in income might have
differed and this possibility might be explored. In this connection
it is worth observing that the "wrong" signs occur (with one exception)
in exchange rates involving the guilder or the French franc; in fact,
these currencies are more often than not associated with "wrongly"
signed bi-lateral income ratios (two out of three and three out of
five occasions, respectively).[1] It might therefore be possible to
argue that a "monetary approach" to the relative income effect is
suitable for the guilder and the franc but a "traditional approach"
should be used for the other currencies in the study, especially the
dollar.

This would suggest that the relative income effect is extremely important as it is significant in all fourteen exchange rates. However, this attempt to argue that significance of the income ratio - whatever its sign - supports the hypothesis of "stable" exchange rates seems rather dubious. An alternative explanation would be to notice that the "wrong" signs occur either in guilder exchange rates or in exchange rates where there have been problems with the income proxy and an alternative has had to be used (or in the Swiss case is unavailable). Dutch protection and extreme gold standard orthodoxy have already been used to explain perverse relative price effects and this argument may also be applicable to relative income effects; it might also be extended to Swiss exchange rates (although the relative price effects were not distorted). The other "wrong" signs can be explained in terms of poor choice of income proxy; it is possible that the proxy is distorted in some way or that it simply does not adequately proxy income and so it is not an "income effect" that is being picked up at all. In conclusion, it is therefore plausible to point to the fact that the relative income variable is significant and correctly signed for nine exchange rates and to interpret this as (at least tentatively) indicating the existence of the expected bi-lateral income effect.

It is less easy to argue a case for the expected bi-lateral interest rate differential effect. Half of these (six)[2] are simply insignificant. (In addition there are problems of inconsistency when some of these interest rate differentials are used as ROW variables; this is discussed below). However, this is not entirely unexpected and some doubts were expressed in chapter two about the importance of interest rate differentials, mainly because of the possibility

that when a capital loss was feared differences in such differentials
might well become relatively unimportant. This may have led to a
situation where a rise in the interest rate was interpreted as a
sign of weakness and therefore led to a capital outflow and hence
a perverse effect; another possible reason for a perverse effect
occurred in the Swiss case since Switzerland was, to some extent,
viewed as a "safe haven" for capital.

In fact, such perverse effects seem, by and large, not to
have occurred; there is only one "wrongly" signed significant
bi-lateral differential and on the other five occasions the variable
was significant and correctly signed. This would suggest that interest
rate differentials did influence exchange rates in the expected manner
to some extent, especially as the insignificance in half the estimates
can plausibly be attributed to an inappropriate choice of interest
rate to proxy "the interest rate".[3] This seems to be particularly
true of the U.S. interest rate which was involved in four of the six
insignificant bi-lateral differentials and, in fact, variables
incorporating the American interest rate were only significant in
one out of the five exchange rates in which they were involved.

Moving on from bi-lateral variables, there is evidence of a
significant ROW "economic" effect and that the use of a third country
to proxy the ROW has been reasonably successful with the ROW price
or income variable (or both) being significant in at least one version
of each exchange rate equation. As with the ratio variables it is
prices more so than income which seem to be important, although
this may of course reflect the inadequacies of the income proxies;
indeed, proxies based on data other than employment indices are used
on several occasions. This argument is likely to be particularly

relevant with regard to the "invisibles effect" (discussed in Chapter 4, Section II) for which a more comprehensive ROW income proxy is probably required than one based on a single country.

ROW interest rate differentials have a less obvious effect and, on the occasions that they are significant, their sign is often inconsistent with the one they carry in estimates of other exchange rates. A variety of explanations were suggested, most of which were rather unsatisfactory. Perhaps it is best remembered that not only are all the problems associated with the bi-lateral interest rate differentials applicable (discussed above) but the ROW differential is effectively a proxy based on two other proxies.[4]

To some extent the performance of the ID's can also be interpreted in terms of the inadequacy of the proxies used: where ID's were based on a number of extensive sources they performed reasonably well but where they were not, they were insignificant. This latter problem occurred for all the minor gold bloc currency ID's for which information was scant and the number of months in which they took a non-zero value was small. The probability is that such variables inadequately represented official intervention and, indeed, the presence of unreported intervention was used (with some plausibility) to explain some of the residuals.

Given these data deficiencies, the only real test for the presence of official intervention therefore occurred in the estimates of the pound-dollar-franc triangle and the results there were very encouraging: the pound-dollar ID and franc-dollar ID[5] were significant and correctly signed in the pound-dollar and franc-dollar estimates and, although the pound-franc ID was insignificant in the OLSQ estimates of the pound-franc,

it is worth noting that this too became significant (and correctly signed) in the CORC estimates. As ROW variables these ID's achieved, perhaps not surprisingly more limited success but, on the few occasions they were significant, they were plausibly signed. Thus there is fairly strong evidence to the effect that official intervention was an important influence on exchange rates in the 1930's although it should, of course, be observed that significance of these variables does not indicate anything about whether such intervention was stabilising, merely that it was effective.

On balance, the seasonal variables also perform quite well. Their unconventional nature - they are sine and cosine waves as opposed to dummy variables - might have caused problems but the incidence of significant seasonal variables with more than one peak and trough is, in fact, fairly small.[6] In most cases there was evidence of a smooth and, where there were any expectations (particularly the pound and Swiss franc), plausible seasonal variation in the exchange rate. The trend variable is also mainly significant and indicates a tendency for the pound and the "minor" gold bloc currencies to strengthen over time whilst the French franc and U.S. dollar weakened. To some extent this is surprising as the only expectation about this variable was that the pound and other European currencies might tend to weaken against the U.S. dollar over time due to increasing fears of war;[7] indeed, this argument may actually apply to the U.S.-Canadian dollar estimates (since Canada was part of the Empire), the one currency against which the U.S. dollar did strengthen. However, from the beginning, two other possibilities were suggested - changes in productivity (which has been applied to the pound in Chapter 5) and simply changes in tastes - and two further arguments were introduced

in the discussion of the empirical tests; firstly, the trend
variable may be picking up the effects of protection (which caused
a "change in tastes") and secondly, the French franc did tend to
move only in one direction (depreciate) and the trend may reflect
this.

(II)

On balance it seems reasonable to conclude that "economic
fundamentals" did play a major role in exchange rate determination
in the 1930's. Nevertheless, it is also clear that there was an
important speculative effect in the sense that many of the speculative
dummies were significant. Their performance was examined in detail
and they were checked for consistency of performance across exchange
rates (as indeed were the "economic fundamentals") in the preceding
chapters. As far as the four "minor" currencies were concerned
speculative effects due to events in these "small" countries seem
to have been of limited importance in the case of Holland and
Switzerland. However, this is less true of Belgium and Canada
and, in any case, a number of British, American and French dummies
were significant in the exchange rates of all four "minor" currencies
which suggests that speculative effects, in general, were of some
importance; this conclusion is strengthened, to some extent, by
the existence of occasionally large residuals. Finally, there was
no inconsistency of performance of the speculative dummies of Canada
and the three smaller gold bloc countries.

The dummies relating to the three "major" currencies were also
discussed earlier but only in the context of the pound-dollar-franc

triangle. The performance of these variables across all the exchange rate regressions in which they were included therefore requires discussion and is summarized in Table 8.1. The most striking feature of this comparison is the consistency of performance of the British and American variables. It is clear that the influences expected to cause the pound to depreciate in 1931 (K1) and mid-1934 (K3) were important but this was not true in 1935 (K4), although it should be pointed out that in the latter case the expectations were weaker, as the weaker pound largely reflected the stronger dollar due to the gold clause judgement. The insignificance of K1 and K3 in the pound-franc estimates was due to "mistiming" and overlap with a significant (and similarly signed) French dummy (F3), respectively. There is also limited evidence to support the contention of a speculative appreciation of the pound in early 1933.[8]

The most obvious conclusion to be derived from the performance of the American dummies is that the dollar was clearly undervalued in the 1933-34 period (S4 and S5)[9] which was widely suggested by many sources and, furthermore, that this undervaluation continued into 1935 (S6); indeed, the residuals of some of the regressions were interpreted as possibly indicating that it continued well into 1935. All the other American dummies were significant and plausibly signed to a greater or lesser degree. This was especially true of S8 and S9 which only failed to show up in the dollar-belga estimates.[10] Thus the gold and dollar "scares" of 1937 appear to have induced an appreciable speculative effect. The effects of S2 and S7 seem only to have occurred in non-gold bloc and gold bloc exchange rates against the dollar respectively; in the latter case this is unsurprising and it was conceded during the construction of the American dummies that

KEY

D = depreciate
A = appreciate
X = insignificant
n.a.= not applicable
* = only significant at low levels or in one version (WP or COL).

TABLE 8.1: SUMMARY OF THE PERFORMANCE OF THE MAJOR SPECULATIVE DUMMIES ACROSS ALL EXCHANGE RATES

EXCHANGE RATE OF POUND AGAINST→ POUND EXPECTED TO →		POUND	U.S. DOLLAR	FRENCH FRANC	CANADIAN DOLLAR	BELGA	GUILDER	SWISS FRANC
K1 (Dec. 31-Feb. 32)	D	-	D	X	D	D	D	D
K2 (Jan.-Feb. 33)	A	-	X	A	D	X	X	A
K3 (May-Aug. 34)	D	-	D	X	X	D	D	D
K4 (March, 35)	D	-	X	X	X	X	X	X
EXCHANGE RATE OF DOLLAR AGAINST→ DOLLAR EXPECTED TO →		POUND	U.S. DOLLAR	FRENCH FRANC	CANADIAN DOLLAR	BELGA	GUILDER	SWISS FRANC
S1 (Oct. 31)	D	n.a.	-	X	X	X	X	X
S2 (Apr.-May, 32)	D	D*	-	X	D	X	X	X
S3 (Nov.32-Mar. 33)	D	A	-	X	A	X	A*	A
S4 (Apr.-Oct. 33)	D	D	-	D	X	D	D	D
S5 (Nov. 33-Dec. 34)	D	D	-	D	D	D	D	D
S6 (Jan-Apr. 35)	A	D	-	D*	D	D	D	D*
S7 (Oct.-Nov. 36)	A	X	-	A	X	X	A	A
S8 (Jan.-June 37)	A	A	-	n.a.	A*	X	A	A
S9 (Oct. 37-July 38)	D	D	-	D*	D	X	D*	D
S10 (Aug.-Dec. 38)	A	A*	-	X	D*	X	X	D*
EXCHANGE RATE OF FRANC AGAINST→ FRANC EXPECTED TO →		POUND	U.S. DOLLAR	FRENCH FRANC	CANADIAN DOLLAR	BELGA	GUILDER	SWISS FRANC
F1 (Nov.-Dec. 32)	D	X	X	-	-	n.a.	X	X
F2 (Nov.-Dec. 33)	D	X	X	-	-	X	X	X
F3 (Mar.-Oct. 34)	A	A	X	-	-	X	X	A
F4 (Apr.-May 35)	D	X	X	-	-	A	n.a.	n.a.
F5 (June-Oct. 35)	?	D	D	-	-	A	D*	D
F6 (Nov. 35)	D	D	X	-	-	A	X	D
F7 (Jan.-Mar. 36)	D	D*	X	-	-	A	A	D*
F8 (June-Sept. 36)	D	A	X	-	-	A	A	A
F9 (Oct.-Dec. 36)	? (D)	A*	D	-	-	X	A	A
F10 (Jan-Feb. 37)	D	A	D	-	-	X	A	A
F11 (Mar.-June 37)	? (D)	A	D	-	-	D	A	A
F12 (July-Oct. 37)	D	X	D	-	-	D	D*	X

TABLE 8.1: <u>SUMMARY OF THE PERFORMANCE OF THE MAJOR SPECULATIVE DUMMIES ACROSS ALL EXCHANGE RATES</u>

EXCHANGE RATE OF POUND AGAINST→ POUND EXPECTED TO →		POUND	U.S. DOLLAR	FRENCH FRANC	CANADIAN DOLLAR	BELGA	GUILDER	SWISS FRANC
K1 (Dec. 31-Feb. 32)	D	-	D	X	D	D	D	D
K2 (Jan.-Feb. 33)	A	-	X	A	D	X	X	A
K3 (May-Aug. 34)	D	-	D	X	X	D	D	D
K4 (March, 35)	D	-	X	X	X	X	X	X
EXCHANGE RATE OF DOLLAR AGAINST→ DOLLAR EXPECTED TO →		**POUND**	**U.S. DOLLAR**	**FRENCH FRANC**	**CANADIAN DOLLAR**	**BELGA**	**GUILDER**	**SWISS FRANC**
S1 (Oct. 31)	D	n.a.	-	X	X	X	X	X
S2 (Apr.-May, 32)	D	D*	-	X	D	X	X	X
S3 (Nov.32-Mar. 33)	D	A	-	X	A	X	A*	A
S4 (Apr.-Oct. 33)	D	D	-	D	X	D	D	D
S5 (Nov. 33-Dec. 34)	D	D	-	D	D	D	D	D
S6 (Jan-Apr. 35)	A	D	-	D*	D	D	D	D*
S7 (Oct.-Nov. 36)	A	X	-	A	X	X	A	A
S8 (Jan.-June 37)	A	A	-	n.a.	A*	X	A	A
S9 (Oct. 37-July 38)	D	D	-	D*	D	X	D*	D
S10 (Aug.-Dec. 38)	A	A*	-	X	D*	X	X	D*
EXCHANGE RATE OF FRANC AGAINST→ FRANC EXPECTED TO →		**POUND**	**U.S. DOLLAR**	**FRENCH FRANC**	**CANADIAN DOLLAR**	**BELGA**	**GUILDER**	**SWISS FRANC**
F1 (Nov.-Dec. 32)	D	X	X	-	-	n.a.	X	X
F2 (Nov.-Dec. 33)	D	X	X	-	-	X	X	X
F3 (Mar.-Oct. 34)	A	A	X	-	-	X	X	A
F4 (Apr.-May 35)	D	X	X	-	-	A	n.a.	n.a.
F5 (June-Oct. 35)	?	D	D	-	-	A	D*	D
F6 (Nov. 35)	D	D	X	-	-	A	X	D
F7 (Jan.-Mar. 36)	D	D*	X	-	-	A	A	D*
F8 (June-Sept. 36)	D	A	X	-	-	A	A	A
F9 (Oct.-Dec. 36)	? (D)	A*	D	-	-	X	A	A
F10 (Jan-Feb. 37)	D	A	D	-	-	X	A	A
F11 (Mar.-June 37)	? (D)	A	D	-	-	D	A	A*
F12 (July-Oct. 37)	D	X	D	-	-	D	D*	X

the "hot money" flows represented by S7 were, to some extent, a gold bloc phenomenon.

The remaining three dummies are less straightforward. S1 is never significant but some of the residuals suggested that this was mainly due to "mistiming" (particularly in the relationship of the U.S. dollar with the French franc and Canadian dollar): the main impact of the shift of speculative attention from the pound to the dollar in late 1931 seems to have been felt in November rather than October. "Mistiming" may also be a problem with S10, especially in the pound-dollar-franc triangle. Similarly the "wrong" sign of S10 in the dollar exchange rates with the Canadian dollar and Swiss franc (and also its insignificance in the Belgian case) may reflect a tendency for these currencies to move in sympathy with the dollar for part of the period that it covers.[11] Finally, S3 is mainly significant but "wrongly" signed. This covers the period in 1932-33 between Roosevelt's election and his taking office and there was some doubt about its expected sign in the first place. The conclusion reached in the earlier discussion of the empirical results seems quite reasonable: the sign of S3 probably reflected a combination of a capital inflow due to confidence engendered by Roosevelt's election and (more likely) official intervention to maintain the value of the dollar in the period immediately preceding its devaluation.

Of the three groups, the speculative dummies that perform least well are those of France; in particular there are several cases of unexpected and apparently inconsistent signs. Two variable - F1 and F2 - are never significant and F4 is significant only once (in the belga-franc estimates) where it is "wrongly" signed. However, this "wrong" sign, it was argued, is due to a belga undervaluation against

the franc in the period between the Belgian and French devaluations
(April, 1935-September, 1936) which also explains the apparently
inconsistent signs of F5, F6, F7 and possibly F8 in the belga-franc
estimates. However, the apparent failure of any speculative weakness
of the franc to show up in other French exchange rates following the
Belgian devaluation is surprising, although it may reflect a mistiming
of F4. In any case, F5 and, to a lesser extent, F6 do indicate that
the franc weakened later in 1935; indeed, the performance of F5
(ignoring the belga) could be interpreted as reflecting both a lack
of confidence in the success of the deflation undertaken by the Laval
administration (whose policy it represents) and a continuation of
doubts about the franc due to the Belgian devaluation.

Three variables, F3, F6 and F12, are significant and correctly
signed in some franc exchange rates whilst F7 is ambiguous; its
"wrong" sign has already been discussed in the belga-franc context
and it may be that the overvaluation of the franc implied there also
applied to the franc-guilder exchange rate, or that there was official
intervention which, since it would be required to maintain any over-
valuation, amounts to the same thing. This leaves F8, F9, F10 and F11
which are "wrongly" signed being associated with a strong franc except
in the case of the dollar and the belga. In the dollar-franc estimates
this apparent inconsistency, it was suggested, was caused by the fact
that these variables overlapped with American dummies and were, in
fact, picking up (plausibly signed) American effects; thus these
French variables were, as in the Belgian case, really insignificant.

Ozmun (1976) had similar problems and suggested that the
"Keynesian flavour" of the Blum experiment may have increased confidence
and attracted capital. This was dismissed as being unlikely, particu-
larly in the Dutch case, and the only plausible explanation that remained

was that the franc was receiving heavy official support in the mid-1936 to mid-1937 period because it was overvalued (even after its devaluation). Such an explanation is supported by the fact that the franc depreciated substantially further in mid-1937.

In general, a sufficient number of the speculative dummies (of all seven countries) are significant and consistently signed to suggest that speculative effects had an important (though not over- whelming, as Nurkse would have it) role in exchange rate determination in the 1930's. However, this conclusion requires heavy qualification. In the first place, the modelling of speculation has proved difficult and the use of dummy variables has not been entirely satisfactory in numerous respects; in particular an "averaging" problem has often occurred (and is apparent from the examination of residuals) due to the inability of a constant value dummy variable to pick up an influence of differing degrees of intensity in different months.[12] Nevertheless, attempts to model speculation by use of a proxy variable based on forward market data were rather less successful and are, in any case, subject to theoretical objections.[13] Furthermore the significant speculative dummies are, in some cases, not picking up speculative influences at all but are "wrongly" signed and it was often argued that they were picking up official intervention aimed at offsetting the speculation or, particularly in the case of the dollar in 1933-35, their significance represented an over- or under- valuation of a currency (which amounts to the same thing). In this sense, the significance of a speculative dummy is not indicative of effective speculation but quite the opposite - that is, successful official intervention.[14]

Another qualification relates to the question as to whether

the significance of dummies picking up capital flows due to speculation
(as opposed to official intervention) is really indicative of de-
stabilising speculation.[15] To the extent that speculators were
acting on the basis of expectations that were correct (in the sense
that their behaviour was likely to push the exchange rate towards
the level it should have been at, given the values of the "economic
fundamentals") and the level of the exchange rate was being artificially
maintained by the authorities, then the speculation was stabilising
rather than destabilising. Even so, having made these qualifications,
to the extent that unexplained exchange rate variations and low Durbin
Watson statistics still exist, this may indicate the presence of
unmodelled and (genuinely) destabilising speculation. Nevertheless,
these qualifications about the speculative dummies would seem to turn
the balance of the interpretation of the regressions to the conclusion
that the most important role in exchange rate determination in the
1930's was played by "economic fundamentals"; it would also indicate
that more importance should be attached to official intervention than
is suggested by the performance of the ID's.

A final "variable" that is probably of importance is protection;
this may also weaken the above argument that large residuals may imply
destabilising speculation since trade controls constitute another
omitted variable and hence they may account for some of the unexplained
variation in exchange rates. It is virtually impossible to quantify
protection and the only attempt to do so (in the Canadian case) was
rather unsuccessful. But quite apart from the residuals, it was
specifically concluded on two occasions (for Holland and Canada)
that protection played some role in influencing the flow of goods
and services and hence currency flows and the exchange rate. It was

also suggested (above) that significant trend variables may have represented the effects of protection. Whilst this may lessen the role of "economic fundamentals" in exchange rate determination in the 1930's, it certainly does not strengthen the Nurkse view of the predominance of destabilising speculation.

(III)

Having reviewed the performance of individual variables across different exchange rates, it might be useful to briefly consider the success of the model on an individual currency basis. In general, with the possible exception of the guilder, the model can be said to have satisfactorily "explained" much of the variation of all seven currencies. The model is perhaps most applicable to the U.S. dollar and especially so in its relationship with the four "minor" currencies. Although it is true that the dollar did go through a sustained period of (deliberately engineered) undervaluation, its underlying trend does seem to have largely followed the path indicated by "economic fundamentals" with a slight interruption due to the gold and dollar "scares" in the latter part of the decade.

The model performed slightly less well in the case of the pound although even here the importance of speculative effects (in the shape of significant speculative dummies) was very limited and the source of deviations from the course indicated by "economic fundamentals" appears more likely to have emanated from the EEA than destabilising speculation. In the case of the French franc, a relatively large number of speculative dummies were significant but the extent to which these represented genuinely destabilising speculation is suspect:

the franc seems to have undergone periods of overvaluation but the highly significant relative price variables - whether WP or COL indices are used - would indicate the underlying importance of "economic fundamentals". Given the political instability and uncertainty in France in this period, this is probably rather more than could have been expected and the performance of the model in successfully "explaining" French franc variation is perhaps particularly noteworthy.

The smaller gold bloc currencies were expected to be less suited to the model and this did turn out to be the case. However, with the exception of the guilder whose path, particularly against the pound, was distorted by protection and extreme gold standard orthodoxy, these currencies did, by and large, follow the course indicated by "economic fundamentals", especially in their relationship with the dollar. Finally, movements in the Canadian dollar were satisfactorily "explained" by the model, especially in view of the fact that it was expected that the role of "economic fundamentals" may have been diminished because of Canadian protectionism and various other factors.

Two final tasks remain: firstly, to weigh up the evidence as to the relative importance of "economic" and "speculative" effects and, secondly, to consider the results presented here in the context of other studies examined in chapter three. A fairly crude attempt was made to compare the relative importance of "economic" and "speculative" influences in the examination of the pound-dollar-franc triangle using F-tests. Whilst this perhaps indicated that "economic fundamentals" were more significant (in the sense of having a higher F-statistics), a more considered interpretation would probably be that both were important. In any case, such an exercise is made rather

tenuous by the fact that whereas the group of "economic fundamentals" is fairly comprehensive, this is not true of the speculative variables which probably only include part of the speculative effect. On the other hand, the discussion of the speculative dummies (above) did suggest that on numerous occasions when these variables were significant, they did not necessarily indicate the presence of speculation and, where they did, it was not necessarily of the destabilising variety. In addition alternative explanations (to speculation) of residuals were found in many cases. On balance, therefore, it seems reasonable to conclude that, although destabilising speculation may have occurred on some occasions in the 1930's, it was certainly not dominant and a greater role in exchange rate determination should be given to "economic fundamentals" and official intervention.

Finally, the results and conclusions presented here are in broad agreement with those in the studies of Hudgins (1973), Ozmun (1976) and Ridpath (1975), which constitute the only comprehensive empirical studies of exchange rates in this period that have been found. Whilst their agreement with the present study is perhaps to be expected, given the similar methodology, the much wider range of the model developed and tested here, in terms of bi-lateral exchange rates examined and variables used (particularly the use of COL indices), would suggest that interpretations of exchange rate movements in the 1930's would perhaps be improved by reference to these studies and the present one, rather than to the assertions of Nurkse (1944) and others. In a wider context the results presented here would indicate that the use of the 1930's experience as a good example of the inherent problems involved in adopting a system of floating exchange rates is erroneous. Furthermore, this issue cannot be dealt with satisfactorily without an examination of multilateral exchange rates which is undertaken in the next section.

FOOTNOTES TO CHAPTER 8

1. Where they are not, either the level of significance is low (belga-franc) or the other currency involved in the exchange rate is the dollar (dollar-franc and guilder-dollar), and in eleven out of the twelve equations involving dollar exchange rates the relative income ratio is significant and correctly signed.

2. No Canadian interest rate is available.

3. The problems are discussed in detail in Chapter 4, Section III.

4. This is also true of the ROW income variable.

5. It must be conceded that the "wide" version was insignificant and it is the "narrow" version that is included in the final regression.

6. That is, variables that suggest two or more periods of seasonal strength and two or more of seasonal weakness in each year.

7. In fact, Ridpath (1975, p. 143) does find a "war scare dummy" significant and correctly signed in his estimates of the pound-Canadian dollar exchange rate but this variable is only operative after Hitler's annexation of Austria in March, 1938 and is of constant value. Therefore, it is rather different to the trend variable used here.

8. The "wrong" sign of K2 in the pound-Canadian dollar estimates is probably caused by an overlap with DC3, a Canadian dummy.

9. The insignificance of S4 in the U.S.-Canadian dollar estimates is probably explained by the depreciation of the Canadian dollar in 1933.

10. The non-applicability of S8 in the dollar-franc estimates was due to overlap with two French dummies (F10 and F11), the significance, coefficients and signs of which (in the dollar-franc estimates), were interpreted as indicating that they were actually picking up not French influences (which they represented) but the American influences associated with S8. Hence S8 was also significant, in this sense, in the dollar-franc estimates.

11. Indeed, in the Swiss case a dummy variable (SW10) was constructed specifically to capture this sympathy movement and was, in fact, significant in the Swiss exchange rate against the pound and the franc. (It was excluded from the Swiss franc-dollar estimates).

12. The obvious solution is to assign different monthly values to proxies covering a number of months. However, not only is it often difficult to do this because of lack of information, but it would be a highly subjective exercise anyway, which is probably best avoided.

13. See Chapter 4, Section IV.

14. It must be conceded that this conclusion is, on occasion, based solely on one possible interpretation of the regression results. However, in other cases, the dummy variable coincides with an observation in one of the ID's (based on actual evidence of intervention).

15. This was discussed in Chapter 4, Section IV.

SECTION III: MULTILATERAL EXCHANGE RATES

CHAPTER 9

THE METHODOLOGY OF EFFECTIVE EXCHANGE RATES

(I)

A detailed examination of bi-lateral exchange rates must provide an integral component of any study of exchange rate movements in the 1930's. However, in the 1970's, following the collapse of the Bretton Woods adjustable peg system, it has become widely accepted that, in a period of floating exchange rates, any individual bi-lateral rate can only partially reflect the overall movement of any particular currency. Consequently, a new concept - the effective or multilateral exchange rate - has been developed, which seeks to take account of the movements of a currency against all others in a single measure. The importance of this indicator in the 1970's has been acknowledged to the extent that the Bank of England now pays more attention to the pound's effective exchange rate than to any individual bi-lateral rate. This section of the present study seeks to apply this concept to the 1930's and this chapter begins the exercise by examining how effective rates are (and should be) calculated.

The need for such an application becomes clear when it is realised that, in the 1930's, the three major currencies - the pound, the dollar and the franc - followed radically different paths (particularly in the 1931-36 period). This implies that the bilateral exchange rates of these (not to mention other) currencies, four of which are included here, inevitably follow a different path according to the choice of numeraire currency. When allowance is

also made for "minor" currencies and therefore other bi-lateral
rates the necessity of examining effective exchange rates in this
period is self-evident. Examples of differences in bi-lateral
exchange rate movements for all seven currencies are provided in
Table 9.1. Thus, for example, the U.S. dollar depreciated 40.8%
against the French franc in the period from January 1931 to January
1936 whilst depreciating only 17.7% against the Belgian franc and
2.1% against the pound, appreciating 20.6% against the Danish krone
and 1.9% against the Australian pound and so on.

Clearly therefore, the basic rationale involved in calculating
an effective exchange rate (EER) is to provide an average (in some
sense) of the movements of the currency concerned against all other
currencies which allows for the fact that bi-lateral exchange rate
movements against different individual currencies may differ in
degree and even in direction. Unfortunately, moving from this
general definition to a more precise definition of an EER creates
various difficulties and rather depends on the purpose for which it
is being calculated. In other words there is presumably an interest
in the effect of exchange rate changes on some variable or policy
objective and the exact definition of an effective exchange rate (and
its weights) is determined by the variable or policy objective which
is chosen as being of primary interest or importance. A fairly
obvious choice would be the competitiveness of exports which would
imply that the effective exchange rate of, for example, the dollar
would be defined as follows: a change[1] in the dollar's effective
exchange rate in a given period should imply the same change in U.S.
export competitiveness that actually did occur as a consequence of
all the exchange rate changes that actually did take place. If the

TABLE 9.1: PERCENTAGE CHANGE IN EXCHANGE RATES (Jan. 1931 to Jan. 1936)[1]

Appreciation (+) against that or Depreciation (−) of: of the currency of:	U.S.A.	Canada	France	Belgium	Holland	Switz.	U.K.	Argentina	Denmark	Spain	Australia	Composite Effective Rate
U.S.A.	−	−0.1	−40.8	−17.7	−41.0	−40.7	−2.1	−7.3	+20.6	−24.3	(+1.9)	−7.5
Canada	+0.1	−	−40.5	−17.5	−40.9	(−40.6)	−2.0	−12.1	+20.6	−24.3	+2.0	−5.1
France	+69.0	+67.9	−	+39.1	−0.3	+0.1	+65.4	(+73.7)	(+103.9)	+28.1	(+72.1)	+45.0
Belgium	+21.5	+21.2	−28.1	−	−28.3	−28.0	+18.8	(+24.8)	+46.5	−7.8	(+23.6)	+3.3
Holland	+69.4	+69.2	+0.3	+39.5	−	+0.4	+65.7	(+74.1)	(+104.4)	+28.1	(+72.5)	+45.0
Switzerland	+68.7	(+68.4)	−0.1	+38.9	−0.4	−	+65.1	(+73.4)	(+103.6)	+27.7	(+71.8)	+42.5
U.K.	+2.2	+2.0	−39.5	−15.8	−39.7	−39.4	−	+15.3	+23.3	−22.9	+4.1	−7.0

Note: (1) Figures in parenthesis are based on cross-rates.

variable of interest were the cost of imports (in national currency) then the effective exchange rate would have to be redefined with the words "export competitiveness" replaced by "cost of imports" and this would imply a different set of weights.

However, whilst such definitions are appropriate when specific variables are of interest, a more general definition would relate the EER to a more generally important variable and the most obvious is the balance of payments,[2] although there are still some problems with this in that it implicitly involves defining "the balance of payments": is it the trade balance, current account, basic balance, total currency flow or something else? In fact most EER calculations focus on the current account and ignore the relationship between exchange rate changes and capital flows; indeed most go even further and concentrate only on merchandise trade, thereby also ignoring invisible trade.[3] This tendency to concentrate on the merchandise trade balance is usually justified in terms of its usefulness in providing some indicator of changes in competitiveness due to exchange rate movements.

Nevertheless, it is important to realise that insofar as an effective exchange rate concentrates on the merchandise trade balance and yet is treated as if calculated in relation to the balance of payments as a whole, it is inaccurate or, at best, an approximation and the weights derived from merchandise trade flows are strictly speaking incorrect (no matter how sophisticated the manner in which they are calculated). For this reason the use of a complex model - along the lines of the IMF's multilateral exchange rate model (MERM), for example - to calculate effective exchange rates, whilst it may provide a sounder basis for calculating weights derived from merchandise

trade flows than simpler methods, still suffers from the fundamental
weakness that it ignores invisible trade and (especially) capital
flows, and its application is therefore strictly limited. This is
not to say that those who calculate EER's from MERM are unaware of
these difficulties[4] but rather to imply that in comparing MERM -
type weighting with much simpler weighting schemes such limitations
should always be remembered.

Having recognised the conceptual necessity of relating an
EER to the balance of payments as a whole and defining a change in
a country's EER as the proportionate change in the value of its
currency against all the other currencies (expressed as an index)
that would have had the same effect on its balance of payments as
all the changes in its bi-lateral exchange rates that actually did
occur, there is, unfortunately, no way in which this can be put into
practice for the 1930's. The reason for this relates mainly to the
lack of any suitable data. Whilst data on invisible trade and capital
flows are available for some countries, they are unavailable, inaccessible
or unreliable for many others and, consequently, to use a weighting
scheme based on the whole balance of payments would reduce the
countries included to an unacceptably small number. Therefore for
purely technical reasons merchandise trade flows only will be used as
a basis for the weighting scheme.[5] However the weights will be
varied and a number of EER's calculated for each country and so the
possibility of invisibles and capital flows having some effect on the
weights will be allowed for in a sense (although the effective rates
presented must remain in principle subject to the limitations discussed
above).

This means that some criteria are required to determine how

exactly the weights should be varied and what has been done is to
use trade flows for three different years which it was found gave a
fairly large variance in the size of the weights, probably enough to
allow for the effects of invisibles and capital flows. The remaining
question to be answered is whether a simple or MERM-type weighting
scheme should be used and the likelihood is that the large amount of
extra work involved in calculating weights based on the latter may
well not be worthwhile since the extra degree of accuracy may be
spurious as neither weighting scheme avoids these more fundamental
objections. Consequently a simple weighting scheme with fairly
widely varied weights seems more appropriate. The choice of weights
is obviously of crucial importance and is taken up again later.

(II)

Having defined the effective exchange rate (and noted the
limitations implied by the definition) the next step is to deal with
three technical aspects of the calculation: these are the selection
of the countries to be included, the choice of base year and the
precise form of weighting scheme (having already opted for weights
based on merchandise trade flows). If it were possible to include
all countries then this would obviate the need to choose countries
for inclusion. However it is not feasible because of lack of
complete data (certainly for the 1930's) nor is it necessarily
desirable. For example if the main interest is the effect of exchange
rate fluctuations on international competitiveness then the countries
included should compete with each other to a significant extent and
the inclusion of countries that are not competitors may be actually
misleading.

More importantly a small open economy may well find itself
a price-taker as far as its exports are concerned with prices
denominated in a foreign currency and, in the case of many developing
countries, its supply of exports may be very inelastic; consequently
an exchange rate change of this small country may have little effect
on the trade balance of other countries since the price of its exports
(denominated in foreign currency) will stay approximately the same as
the exchange rate change will be largely reflected in changes in export prices
in local currency.   Unfortunately a simple trade share weighting
scheme implies that price elasticities of demand for all goods in
all countries are equal which is obviously incorrect in this context
whilst a weighting scheme based on trade balance effects of exchange
rate changes (like the MERM-weights) would have to calculate elas-
ticities (which may not be easy) or make assumptions about them.
For these reasons it may be better actually to exclude some countries -
probably the developing countries - and concentrate on industrial
countries where, if the former weighting scheme is used the assumption
of equal price elasticities is more plausible and if the latter is
used reliable estimates of price elasticities of different countries
are more likely to be readily available.

The present calculation largely ignores these difficulties and
is clearly, therefore, subject to criticism on the above grounds.
However, it was felt that some of the more questionable countries
included were so important in terms of trade flows that, in the absence
of any conclusive evidence that they did adjust their export prices
in local currency and maintain them at the same level in foreign
currency, their large share of trade (particularly bi-lateral trade
with some of the countries whose effective exchange rates are being

calculated) justified their inclusion. In any case observed
changes in export prices in local currency may not be entirely
passive but may represent a deliberate choice to maintain export
prices in foreign currency terms (presumably for reasons of competi-
tiveness). The lack of a trade balance effect is therefore due to
deliberate policy aimed at offsetting exchange rate effects which
would presumably otherwise have taken place. Given that an effective
exchange rate seeks to isolate exchange rate effects only, then
adjusting a country's weights (or excluding it altogether) to allow
for a deliberate policy would be invalid.

The position adopted by Honohan (1979) in his discussion of
the treatment of agricultural and primary producers would seem to
be very much in this spirit:

> "The idea of modifying indices to take account of
> special factors, such as the response of agricultural
> trade to exchange-rate changes has considerable merit.
> However, such modifications can be multiplied to the
> point where the 'index' is more like the prediction
> of a complex model, based on many unproven assumptions,
> than a simple summary measure of a range of exchange
> rate movements. Such models will always be subject
> to misunderstanding and controversy....and will not
> attract universal acceptance. For this reason there
> is merit in retaining simple, albeit crude, indices...." (6)

Thus the indices presented here have merely concentrated on maximising
the number of countries included subject to availability of data. This
has meant that all major trading countries are included along with
a large number of less important ones with the result that countries
accounting for approximately 90 per cent of bi-lateral trade and
three-quarters of total (global) trade flows are included. [7]

The choice of base year for an effective exchange rate index
is not particularly important except insofar as there is sometimes

a tendency to treat the base period as in some sense "normal" or more specifically a period in which the exchange rate was at an equilibrium level. This is mistaken as the choice of base year is usually rather more pragmatic:

> "The base date is normally chosen so as to make the
> index show deviations from a set of rates to which
> general interest attaches, say from par values in
> existence at the time when they were last generally
> observed". (8)

Thus for the 1970's the date of the Smithsonian Agreement (December 1971) or the month preceding the shift to generalised floating (March 1973) is appropriate. In the absence of anything better this convention of choosing the last period of fixed par values was followed in the present calculations and the year 1929 was chosen as the base as it represents a year in which most of the countries were still on the gold standard.[9] At a more simplistic level the calculations are of effective rates for the 1930's and so the last full year preceding the decade is an obvious choice of base. So long as the lack of significance of the base period is remembered then the period actually chosen is not important.[10]

The third technical aspect of the calculations which requires attention is the most difficult one and relates to the choice of weights. This has already been discussed and the limitations of basing the weights on merchandise trade flows only and excluding invisible trade and capital flows have been indicated. The present discussion mainly relates to the choice of the different weighting schemes that can be derived from merchandise trade flows. However, an initial difficulty relates to the choice of period from which to take data on trade flows on which the weights are to be based; this

will generally differ from the base period of the effective exchange
rate itself. The practice for the calculation of current effective
rates is to use recent data and periodically update this to allow
for the fact that trade patterns may change over time for reasons
other than changes in exchange rates and in fact the IMF has recently
done this so that the weights it uses are now based on data in 1977.[11]

The problem of finding up-to-date data on trade flows is in
principle easier for past periods. However, in practice the data may
not exist, be incomplete or at least extremely difficult to gather
for the number of countries involved. Therefore use has been made
of the League of Nations' "Network of World Trade" which has complete
data on visible trade flows for a large number of countries for three
years: 1928, 1935 and 1938. This still leaves the question of which
year to choose and it would be possible to calculate both a Laspeyres
index based on all three years and a Paasche index with weights (for
example) for 1930-32 based on 1928 trade flows, for 1933-36 on 1935
trade flows and for 1937-39 on 1938 trade flows.

The theory of index numbers indicates that a Laspeyres index
would overstate the importance of an appreciating currency and under-
estimate the importance of a depreciating currency (since no allowance
would be made for the changes in quantity caused by the price changes)
whilst a Paasche index would do the opposite. This would suggest that
some average of Laspeyres and Paasche indices would be appropriate.[12]
However, the former is preferred for a number of reasons: firstly,
since separate indices based on trade flows from each of the three
years are calculated then a Paasche index has effectively been calculated
and, by examining the range of variation between the different indices,
is being implicitly compared;[13] secondly, the sole Paasche index

which is explicitly calculated (for the pound) was very similar
to the Laspeyres version anyway and, indeed, the major difficulty
(and difference) probably relates to reconciling bi-laterally and
globally weighted indices; finally, Paasche indices would have to
be based on limited data (for only three years, one of which is
outside the 1930's) and would consequently be very crude. For these
reasons, and also for the sake of simplicity, the weights chosen for
all the main indices presented below are an average of the weights
derived from all three years for which suitable data are available.

However, the most important difficulty to be overcome, having
decided that the weights are to be based on visible trade flows and
having chosen the years for which the trade flows are to be taken,
is to decide which of the different ways of calculating weights from
trade flows is to be used. The simplest and most obvious method is
to use weights based on bi-lateral trade shares: for example, the
weights for the dollar's EER would be calculated on the basis of the
share of each country in U.S. trade (imports and exports).[14]

Unfortunately this is open to three fundamental objections:
firstly, such weights ignore competitive relations in third markets
between the U.S. and other countries - for example, the U.S. may have
very little bi-lateral trade with a particular country but may compete
intensively with that country in the rest of the world and consequently
a change in the exchange rate of the dollar against that country's
currency may have extensive effects on the U.S. balance of payments and
these would not be picked up by a bi-lateral trade-weighted effective
exchange rate of the dollar; secondly, bi-lateral weights take no
account of the different price elasticities for different countries
and different goods which will imply, for example, that the effect of

changes in the exchange rate of the dollar against the currencies
of two countries with identical shares in U.S. trade on the balance
of payments will differ if, as is very likely, these countries have
different price elasticities of demand and supply; finally; bi-lateral
weights do not allow for changes in the prices of traded goods induced
by changes in exchange rates which may offset the effect on the balance
of payments of the original exchange rate changes.[15]

The first of these objections can be overcome by basing the
weights on global trade shares (country shares of total world trade)
although this has the disadvantage of ignoring important bi-lateral
trading relationships such as that between the U.S.A. and Canada.
However an acceptable compromise might be achieved by using an average
of the bi-lateral and global weights. Unfortunately this does not
deal with the two latter objections. This is because such a simple
trade-weighting scheme does not directly deal with the question of
primary interest which is what proportionate change in the dollar's
EER would imply the same effect on the U.S. balance of payments as
that caused by the changes in individual bi-lateral dollar exchange
rates which actually did occur. To answer this question, account must
be taken of the different price and supply elasticities of different
countries (and goods); this is precisely what the IMF's MERM tries to
do.

This would seem to provide a good case for basing the weights
on a multi-lateral exchange rate model for the 1930's. The problem
is that in order to do this a great deal of information about price
elasticities of different goods in different countries along with a
number of other basic parameters (including supply and expenditure
elasticities) are required. The task of obtaining reliable estimates

of these parameters is difficult enough for the calculation of
current effective exchange rates and frequent recourse to assumptions
is required where such estimates are not available. A critique of
MERM (in 1976)[16] pointed to some of the more questionable assumptions
made in the model which in some ways are only more acceptable than the
assumption of equal price elasticities implied by a simple trade weighted
index because of the exclusion of non-industrial countries.[17] The
provision of estimates of similar parameters for the 1930's would be
a Herculean if not impossible task and the actual weights derived
would only be as reliable as the parameters included and consequently:

> "While this approach is, for many purposes, an improvement
> over the simpler weighting schemes from a conceptual view-
> point, it has the practical limitation that existing
> techniques for estimating elasticities, as well as data
> problems, are such as to raise the question of whether
> the inevitable wide margin of uncertainty surrounding the
> elasticity figures offsets the advantages of the more
> elaborate technique for deriving the weights." (18)

This is particularly true for the 1930's. Moreover, the limitations
due to ignoring invisible trade and capital flows apply with equal
force to any weighting scheme based solely on merchandise trade flows.

However, the decision to use a simple weighting scheme creates
its own problems: the choice between bi-lateral and global (or multi-
lateral) weights is conceptually difficult since both are subject to
major drawbacks. Not only do the former ignore effects in third
markets but they implicitly assume that the home country (the one
whose effective rate is being calculated) has the same elasticity
of demand for all imports, whatever their source; whilst the latter
underemphasise important bi-lateral trading links and implicitly
assume identical elasticities of demand for the home country's exports
in all foreign countries.[19] Thus both weighting schemes ignore

important trade effects and make unrealistic assumptions about elasticities.

Not surprisingly, therefore, different authorities favour different weighting schemes. The Federal Reserve Board apparently prefers multilateral weights in the case of the U.S. dollar partly because bi-lateral weights give an excessive (and unwarranted) importance to Canada and partly because empirical tests suggest that a multilaterally weighted index is marginally better at predicting changes in the American trade balance.[20] On the other hand, the Morgan Guaranty Trust Company favours bi-lateral weights because they tend to be more stable and relate directly to the exchange rate effects on prices which actually confront buyers and sellers in each national market and also because multilateral weights inadequately reflect third market effects anyway.[21]

Consequently, given the inherent weaknesses in both types of weighting scheme, it would seem plausible to argue that the choice rather depends on the purpose for which the effective rate is being calculated and indeed, possibly for which country. Unfortunately, whilst this may be true, it provides no guidance for selecting an acceptable weighting scheme to produce an approximation of a "general purpose" effective rate which can be used for all countries. The matter is further complicated by the fact that there are substantial differences between indices calculated both for the current period[22] and the 1930's[23] (using the different weighting schemes). Since there is no theoretical reason for preferring either (in general), as both have major drawbacks, some kind of averaging procedure seems reasonable.

This raises the question as to how exactly this should be done.

There are two obvious methods - arithmetic and geometic averaging -
and a third possibility is to use the harmonic average. The main
difference would seem to be that geometric (and to an even greater
degree harmonic) averaging would tend to reduce the weights (compared
to the arithmetic average) of countries which had a large share of
bi-lateral trade but a small share of multilateral trade (or vice
versa)[24] and increase the weights of those which had similar shares
of bi-lateral and multilateral trade. This may be seen as a desirable
property to the extent that it increases the weights of countries
which tend to be equally important in bi-lateral and global (total)
trade, although it may tend to give disproportionately large weights
to countries which have similar but small shares of both bi-lateral
and global trade.[25]

Partly for the above reasons, geometrically averaged weights
were preferred for the pound's effective rate.[26] This was the
first to be calculated and consequently was subject to most experi-
mentation (in the same way as the pound-dollar exchange rate was the
first bi-lateral rate to be estimated and was therefore subject to
most experimentation). On the basis of comparing different indices
for the pound, it quickly became clear that this degree of sophistication
and complication was unnecessary and so a simple arithmetic average was
used for the subsequent calculations of the effective rates of the
other six currencies. In any case, it is not unreasonable to argue
that there are strong a priori grounds (in the shape of data deficiencies
and other difficulties) for regarding this as a relatively trivial
problem.

Finally, it should be remembered that the choice between bi-lateral
and multi-lateral weights is, to some extent, an empirical one. Fortunately,

if it is accepted that MERM-weights are likely to be fairly accurate
(given that the effective rate is being calculated with reference to
the trade balance only), there are two studies whose results can be
interpreted as suggesting that the "correct" weights lie somewhere
between the bi-lateral and multilateral weights. Rhomberg (1976)
calculates a number of different indices for a variety of currencies
in the 1970's and concludes:

> "...the MERM-weighted index more often than not (in
> 9 of 15 cases) falls between the two trade-weighted
> indices....It assumes the largest or smallest of the
> calculated index values in only 5 of the 15 countries
> and even then it does not deviate very much from the
> trade-weighted index that is closest to it". (27)

Much the same can be said about a similar study in World
Financial Markets (1979).[28] In eight out of fifteen cases the
MERM index lies between the bi-laterally and globally weighted indices
and in five others it is within $2\frac{1}{2}\%$ of the nearest trade-weighted
index. This leaves only two countries (Denmark and Sweden) for which
the MERM-index is appreciably outside (in both cases above) the range
between the two similar indices. Nor is it clear that the bi-laterally
and globally weighted indices are always related in a systematic way.[29]
Thus, the (fairly limited) empirical evidence would suggest that, on
the basis that the MERM-index is the "best" one - admittedly not an
unquestionable assumption (and, indeed, its fallibility has already
been indicated) but perhaps the only one available - an average of
bi-lateral and multilateral weights is more likely to produce a
reasonable approximation than either system used on its own.

(III)

There is one final problem which relates to the high degree of

protectionism in the 1930's. Tariffs and quotas could distort an
effective exchange rate in that even if the weights are "correct"
and derived from a MERM-type model which incorporated invisibles
and capital flows, given exchange rate changes would not lead to
the expected changes in the balance of payments and consequently
weights that did not allow for trade controls would be incorrect
in a sense. Unfortunately there is no totally satisfactory method
of incorporating this adjustment. However, it is, in effect,
partially allowed for in the following way: an increase in a
country's level of protection is tantamount to an appreciation (in
that it is an alternative way of relieving balance of payments pressure
to depreciation) and, although its exchange rate will not change, its
share of trade (both bi-lateral and global) will decline and so the
country's weight in any other's effective exchange rate index will
also fall; thus, in spite of the quoted exchange rate remaining the
same, the total contributed to other countries' indices by the country
increasing import controls will fall, thereby (to a certain extent)
allowing for its higher level of protection. This provides an
argument for ignoring 1928 trade flows and basing the weights on
1935 (or 1938) trade flows although, in any case, bi-lateral exchange
rates are subject to the same distortion and so perhaps such adjustment
is unnecessary. More fundamentally, it may be argued that an effective
exchange rate should more properly be concerned with balance of pay-
ments effects due solely to exchange rate changes and adjusting
weights to allow for deliberate acts of policy is inappropriate.[30]

To summarise then, the EER's calculated here can be defined as
follows: a change in a country's EER equals the proportionate change
in the value of its currency against all other currencies (expressed

as an index) that would have the same effect on its trade balance
as all the changes in its bi-lateral exchange rates that actually
did take place. The weighting system is based on data on trade
flows in three years - 1928, 1935 and 1938 - contained in the
League of Nations's "Network of World Trade" (1942). Specifically
the weights are an average (either geometric or arithmetic) of two
sets of weights: one based on the average of weights derived from
bi-lateral trade flows in each of the three years, the other on the
average of weights derived from global trade flows (country shares
of total world trade) in each of the three years.

APPENDIX TO CHAPTER 9: THE IMF'S MULTILATERAL EXCHANGE RATE MODEL (MERM)

The MERM has been developed in the IMF's Research Department
to analyse the effects of exchange rate changes on trade flows in the
medium term (that is, after an adjustment period of two or three years).
It is, therefore, inappropriate to use MERM to consider either the
short run (one year or less) or the long run effects of such changes.
One of the major applications of MERM has been to develop a weighting
pattern for simultaneous changes in a number of exchange rates, in
order to derive an indicator of the extent to which the external value
of a given currency has changed in relation to other currencies in
general; this indicator is the effective (or multilateral) exchange
rate.

The MERM is continually being further developed and two versions
of it have been described in the IMF Staff Papers: MERM I in

Artus and Rhomberg (1975) and MERM II in Artus and McGuirk (1981).

The critique of MERM by Dixon (1976) discussed earlier in the chapter

related to MERM I (although much of it is still valid if, in some

cases, to a slightly lesser extent). The description of MERM in

this appendix, however, is of MERM II, the current version, and

draws heavily on Artus and McGuirk (1981) who summarise it thus:

> "/The/...theoretical structure /of MERM/ is basically
> the Walrasian general equilibrium framework, simplified
> to a great extent by the use of input-output relationships.
> As far as possible, the numerical values for the various
> behavioural parameters were derived from econometric
> studies; however, emphasis was placed on maintaining the
> structural relationships derived from economic theory
> rather than modifying these relationships according to
> data availability. A priori judgement was used, when
> necessary, in the choice of parameter estimates". (31)

The MERM is based on three major assumptions: firstly, that

costs and prices (in local currency) are somewhat inflexible. If

this were not the case then, since costs and prices could be adjusted

easily and quickly by monetary policy, exchange rate changes would

not be needed to maintain balance of payments equilibrium; the

assumption therefore implies that an exchange rate change will help

to restore equilibrium (by changing the relative price structure).

The second assumption is that "many of the countries, in particular

the industrial countries, produce differentiated goods that are faced

by finite, in fact sometimes small, price elasticities of demand in

world markets;"[32] this implies that changes in exchange rates,

through relative price effects, cause a reallocation of demand among

similar, but differentiated goods produced by different countries.

The third major assumption is that "the overall level of nominal

final domestic demand can be influenced by the central authorities."[33]

This allows the model to concentrate on what is believed to be more

relevant, namely the effect of exchange rate changes on the
allocation of demand rather than on its overall level (in real
terms).

There are eighteen countries and two groups of countries
(the major oil exporters and the rest of the world) in MERM and
six groups of goods (five traded and classified according to the
SITC, one non-traded). Each good is both an intermediate and a
final product[34] and is differentiated by its country of origin
creating 120 "products" (20 x 6). Each "product" has a single supply
function but a separate demand function in each market (country), with
the exception of the non-traded good which has only one (domestic)
market, creating a total of 120 supply functions and 2,020 demand
functions (5 goods x 20 countries x 20 markets plus one non-traded
good x 20 countries). Demand for each product is a function of
expenditure on the good and the prices of all products. Supply of
each product depends on prices in the supplying country; shift
parameters are also incorporated to allow for changes in wages and
indirect taxes induced by the effect of changes in exchange rates
on the cost of living. The model is closed by assuming equality
of supply and demand for each product and that the level of real
output in each country remains constant. The various basic para-
meters - price elasticities, expenditure elasticities, trade shares,
supply elasticities and supply shift factors - have to be either
calculated, estimated or assumed for the model to be used.

A number of reservations about the suitability of MERM for
calculating EER's might briefly be expressed at this point.[35] Firstly,
it takes no account of invisible trade and capital flows; this deficiency
has already been highlighted and it must be conceded that it is equally

true of all the weighting schemes discussed (and indeed used) in the present study. Secondly, as indicated above, it is concerned with the reallocation of demand following exchange rate changes and assumes that (real) output and employment remain unchanged; short run output effects can occur because of exchange rate changes and the model ought to recognise this and its implications for the balance of payments (and hence for the weights used to compute EER's). Thirdly, the assumption that exchange rates are determined exogenously (by governments) is not acceptable, especially in the context of the present study which is largely based on the contention that exchange rates are primarily determined by prices.

Nevertheless, in spite of these problems, it might well be true (as Honohan, 1979, points out) that:

> "....the weaknesses of the MERM for modelling balance-of-payments developments may not seriously impair its ability to calculate effective exchange-rate changes. It may be quite suitable for finding the unilateral depreciation which, in terms of balance-of-payments effects, is equivalent to a set of actual bilateral exchange rate changes, even if its estimates of these balance-of-payments effects may be inaccurate". (36)

if it were not for the final criticism of MERM which has already been extensively stated: the elasticities employed to give numerical content to the model are either assumed or based on limited empirical evidence. However, all calculations of EER's make assumptions about elasticities and at least MERM does this explicitly rather than implicitly. Consequently, it may be the case that, whilst less than ideal, MERM provides the best available means for calculating EER's in the current period (although its potential application to the inter-war period is doubtful).

FOOTNOTES TO CHAPTER 9

1. Effective exchange rates are always defined in terms of change. This is because the concept of an EER cannot be expressed in absolute terms. For example, in January, 1931 the pound was worth $4.855 but it is not possible to "quote" the pound's EER in a similar fashion; this can only be done in terms of how the EER has changed since an earlier period.

2. An alternative "general definition" would involve using the EER as an indicator of changes in the overall asset value of a currency. This is not explored here mainly on the grounds that it is more usual to calculate EER's with reference to balance of payments changes, presumably because this is considered to be more important. However, it should be pointed out that such an index could be calculated but that data on trade flows would not provide a suitable basis for the weights; GDP data may be most appropriate for this purpose (and indeed is used to calculate the value of the écu, the "reserve asset" of the European Monetary System). For this reason the EER's presented here are not really suitable for this purpose and, indeed, most indices calculated for current EER's are similarly "less than ideal" (Honohan, 1979, p. 84).

3. One study – Hirsch and Higgins (1970) – concentrates solely on trade in manufactures and uses this as a basis for the weights.

4. Indeed, the limitations of the EER's calculated from the IMF's MERM are made quite clear in Artus and Rhomberg's (1975) description of MERM (p. 591). A summary of MERM is provided in the appendix to this chapter.

5. Thus, changes in a country's EER (calculated here) are more accurately defined as: the proportionate change in the value of its currency against all other currencies (expressed as an index) that would have the same effect on its trade balance as all the changes in its bi-lateral exchange rates that actually did occur.

6. Honohan (1979), pp. 88-89.

7. The figures for the bi-lateral trade of the U.K. (86%) and the U.S. (80%) are slightly lower than for the other five countries.

8. Rhomberg (1976), p. 88.

9. For the pound's EER the base period is slightly different; it is the average for 1929-30. The difference arises because this calculation was undertaken (much earlier) as a separate exercise and an average of the 1929-30 period was chosen because these were the last two full years that Britain was on the gold standard. In fact this change of base makes little difference: on the basis of 1929 = 100 the pound's EER in 1930 only increased to 101.916. Therefore to rebase the pound's EER from 1929-30 = 100 to 1929 = 100 would simply involve a multiplication by 1.00958. (Consequently, a 1929-based version of the pound's EER would be approximately one percentage point higher).

10. For example, a change in the base year of the current effective exchange rate of the pound (to 1975) was announced in January, 1981. This is of little importance. The base year does, however, become important in the next chapter when multilateral PPP tests are carried out.

11. Previously, data for 1972 and, before that, 1969 were used. Indices using weights based on 1977 trade flows appeared for the first time in the January, 1981 issue of "International Financial Statistics". (This updating also applies to other aspects of the IMF's MERM).

12. Indeed, in a very early calculation of the pound's EER (not presented here), a Fisher ideal index was calculated (involving a geometric average of the Laspeyres and Paasche indices).

13. In fact, this is a more severe test for the extent to which Laspeyres and Paasche indices may vary since the latter would not have, for example, used weights based on 1928 data for 1938 and weights based on 1938 data for 1931, as is done in some of the indices calculated here.

14. Some indices use either exports or imports. However, all trade weighted indices discussed in this study are based on imports plus exports.

15. This point is particularly relevant in the case of developing countries with inelastic supply schedules and has already been discussed in this context above.

16. Dixon (1976).

17. These include the assumptions that supply elasticities are the same for all countries and that expenditure elasticities are equal to one. This latter point received particularly severe criticism: "Expenditure elasticities are comparatively easy to measure, and there would seem to be little justification in simply assuming them all to be 1. For example, elasticities in the food group (SITC 1) have systematically been found to be less than 1." (Dixon, op.cit., p. 74). MERM is also criticised for its rigid definition of final and intermediate goods and for recognising only one type of user of the former.

18. Blackhurst and Tumlir (1980), p. 64. A similar view is taken by the Morgan Guaranty Trust Company: "Although the theoretical cogency of..../MERM/....is attractive, the model's empirical realism is less certain. Many assumptions and guesstimates of real world parameters are required". (World Financial Markets, 1979, p. 9).

19. Moreover, neither weighting scheme makes any allowances for differences in supply elasticities.

20. Hooper and Morton (1978), p. 786.

21. World Financial Markets (1978), p. 7. The third argument is rather a curious one since it would seem equally valid to argue that bi-lateral weights inadequately reflect bi-lateral effects (for exactly the same kind of reason).

22. See Rhomberg (1976) and World Financial Markets (1979).

23. See Chapter 10 below.

24. For example, a country accounting for 1% of bi-lateral (or global) trade and 9% of global (bi-lateral) trade would have an arithmetically averaged weight of 4.5, a geometric weight of 3.0 and a harmonic weight of 1.8. In practical terms, it would reduce the weights of "smaller" countries which can often be important in the bi-lateral trade of certain countries but relatively insignificant in global trade flows. Good examples are provided by colonies of many European countries and by Canada (arithmetic weight = 11.38, geometric weight = 9.36) in the case of the U.S. dollar.

25. Consider a country with 0.95% of bi-lateral and 1.05% of global trade. The arithmetic weight is 1.0 and the geometric weight is 0.999. The latter is apparently smaller but once this has been "scaled up" to compensate for the fact that geometrically averaged weights sum to less than a hundred, it will actually be larger than the arithmetically averaged weight.

26. The weights summed to less than a hundred leaving a small residual which could be allocated to the U.S. to increase the weight of that country which was felt to be desirable; this was an additional reason for adopting a geometric average.

27. Rhomberg (1976), p. 100. It should be pointed out that Rhomberg himself interprets these results rather differently: "It cannot be assumed, therefore, that one of the trade-weighted indices, or any average of them, is an acceptable substitute for the MERM-weighted index". (op.cit., p. 101). However, this comment relates to a slightly different context and assumes that finding plausible values for MERM parameters is not impractical.

28. This discussion is based on World Financial Markets (1979), Table 3, p. 7, which compares nominal EER's for March, 1979 using bi-lateral multilateral and MERM weighting schemes (March, 1973 = 100).

29. Although there is a tendency for the global index to be the higher (in eleven cases), the difference between the two simple indices varies considerably (and is often small) and the four countries for which the bi-lateral index is the higher include the U.S. and Japan.

30. This point has already been made in connection with countries deliberately maintaining prices of their exports in foreign currency (and adjusting them in local currency) in order to offset exchange rate effects.

31. Artus and McGuirk (1981), p. 275.

32. Ibid, p. 277.

33. Ibid.

34. This is a modification of MERM I which goes some of the way to disarming one of Dixon's (1976) criticisms referred to in footnote 17 above

35. This paragraph and the next draws heavily on Honohan (1979), pp. 82-4. See also Dixon (1976).

36. Honohan (1979), p. 83.

CHAPTER 10

EFFECTIVE EXCHANGE RATES FOR THE 1930's

AND SOME APPLICATIONS

(I)

The calculations of the EER's proceeded as follows: for each currency twelve indices (plus a few extra in the case of the pound) were calculated. This was done for three reasons: firstly, to make full use of the available data; secondly, there was no way of deciding which set of data (available for three separate years) was most appropriate and therefore it seemed reasonable to try all possible permutations; and thirdly, varying the weights illustrated whether or not basing them solely on visible trade flows introduced a substantial degree of bias, to the extent that the variation in each country's weight was sufficiently large to accommodate any change that would be required to the visible trade based weights to allow for invisible and capital flows of a feasible size (although this is admittedly a rather tenuous method of dealing with this problem).

The twelve indices can be divided into three groups of four. Four bi-lateral indices were calculated with weights based on bi-lateral trade flows (imports plus exports) in three different years - 1928, 1935 and 1938 - and on an average of the weights derived from trade flows in these three years. Four parallel global indices used countries' shares of total (global) trade[1] and four "average" indices used the average of the bi-lateral and global weights in 1928, 1935 and 1938 and the average of the weights used in the average bi-lateral and average global EER's (the composite index). In the case of the pound,

a Paasche index[2] and two indices in which the weight of the U.S.
were increased (to follow for the fact that the dollar is important
for reasons other than trade[3]) were also calculated.

There are several other differences between the calculation
for the pound and those for the other six currencies, mainly because
the pound's EER was calculated first and was subject to most experi-
mentation, in the light of which the method of calculation was modified.
One difference has already been referred to in the preceding chapter
and relates to the fact that the "average" in the calculation of the
pound's EER is geometric whereas in the others it is arithmetic. This
difference largely arises from the fact that experimentation with the
pound's EER indicated that differences between variants were relatively
small and consequently use of geometric averaging represented unnecessary
sophistication.

Two further differences exist but are relatively minor and
relate to the different choice of base period for the pound and the
inclusion of one less country (28 compared to 29 for the others). The
pound's EER uses 1929-30 as its base period while the later calculations
use 1929 only (and in fact calculate monthly values of EER's from the
beginning of 1930). However, the final (composite) version of the
pound's EER can quite easily be adjusted (to make it comparable) and
rebased on 1929 by simply multiplying any given value by 1.00958.[4]
The reason why there is one less country in the calculation of the
pound's EER is that when the second EER - that for the U.S. dollar -
was examined it was felt necessary to add Mexico since it had a
significant share in U.S. bi-lateral trade in the 1930's (approximately
3 per cent) and Mexico was subsequently included in all EER calculations.
Given the small share of Mexico in world trade in general and British

bi-lateral trade in particular ($\frac{1}{3}$%), it hardly seemed worthwhile
to recalculate all the variants of the pound's EER to incorporate
this extremely minor adjustment.

Having noted these differences, the purpose of the rest of the
chapter is twofold: firstly, to examine the empirical aspects of the
problem of choosing an index which can be put forward as the most
representative EER of those calculated for any particular currency,
which basically involves looking at the consequences of varying the
weighting pattern; secondly, to undertake a very brief consideration
of some of the implications of EER's in terms of a reinterpretation
of some economic aspects of the 1930's.

(II)

A graphical comparison of the different types of index for
the seven currencies is presented in Figs. 10.1-10.7. With the
exception of the pound only the average bi-lateral and average global
(and composite) indices are shown since the differences within the two
"families" of indices tends to be relatively small and it is differences
between indices based on the different types of weighting scheme that
are important.   This limited variation within the two "families" is
indicated by the two additional graphs for the pound's EER's (Figs. 10.1A
and 10.1B) which plot the range of variation[4] within the families of
bi-lateral and global indices. The range of variation is seen to be
small with the possible exception of the lower limit of the bi-lateral
indices where the point at which the pound regains its 1929-30 value
is much later, and is nearer the point indicated by the global indices
(1937), than that of the other bi-lateral indices.

bi-lateral trade in particular ($\frac{1}{3}$%), it hardly seemed worthwhile
to recalculate all the variants of the pound's EER to incorporate
this extremely minor adjustment.

Having noted these differences,the purpose of the rest of the
chapter is twofold: firstly, to examine the empirical aspects of the
problem of choosing an index which can be put forward as the most
representative EER of those calculated for any particular currency,
which basically involves looking at the consequences of varying the
weighting pattern; secondly, to undertake a very brief consideration
of some of the implications of EER's in terms of a reinterpretation
of some economic aspects of the 1930's.

(II)

A graphical comparison of the different types of index for
the seven currencies is presented in Figs. 10.1-10.7. With the
exception of the pound only the average bi-lateral and average global
(and composite) indices are shown since the differences within the two
"families" of indices tends to be relatively small and it is differences
between indices based on the different types of weighting scheme that
are important. This limited variation within the two "families" is
indicated by the two additional graphs for the pound's EER's (Figs. 10.1A
and 10.1B) which plot the range of variation[4] within the families of
bi-lateral and global indices. The range of variation is seen to be
small with the possible exception of the lower limit of the bi-lateral
indices where the point at which the pound regains its 1929-30 value
is much later, and is nearer the point indicated by the global indices
(1937), than that of the other bi-lateral indices.

FIG. 10.1A   U.K. BILATERAL EER WITH RANGE OF VARIATION

FIG. 10.1B   U.K. GLOBAL EER WITH RANGE OF VARIATION

FIG. 10.1C   U.K. EER's COMPARED
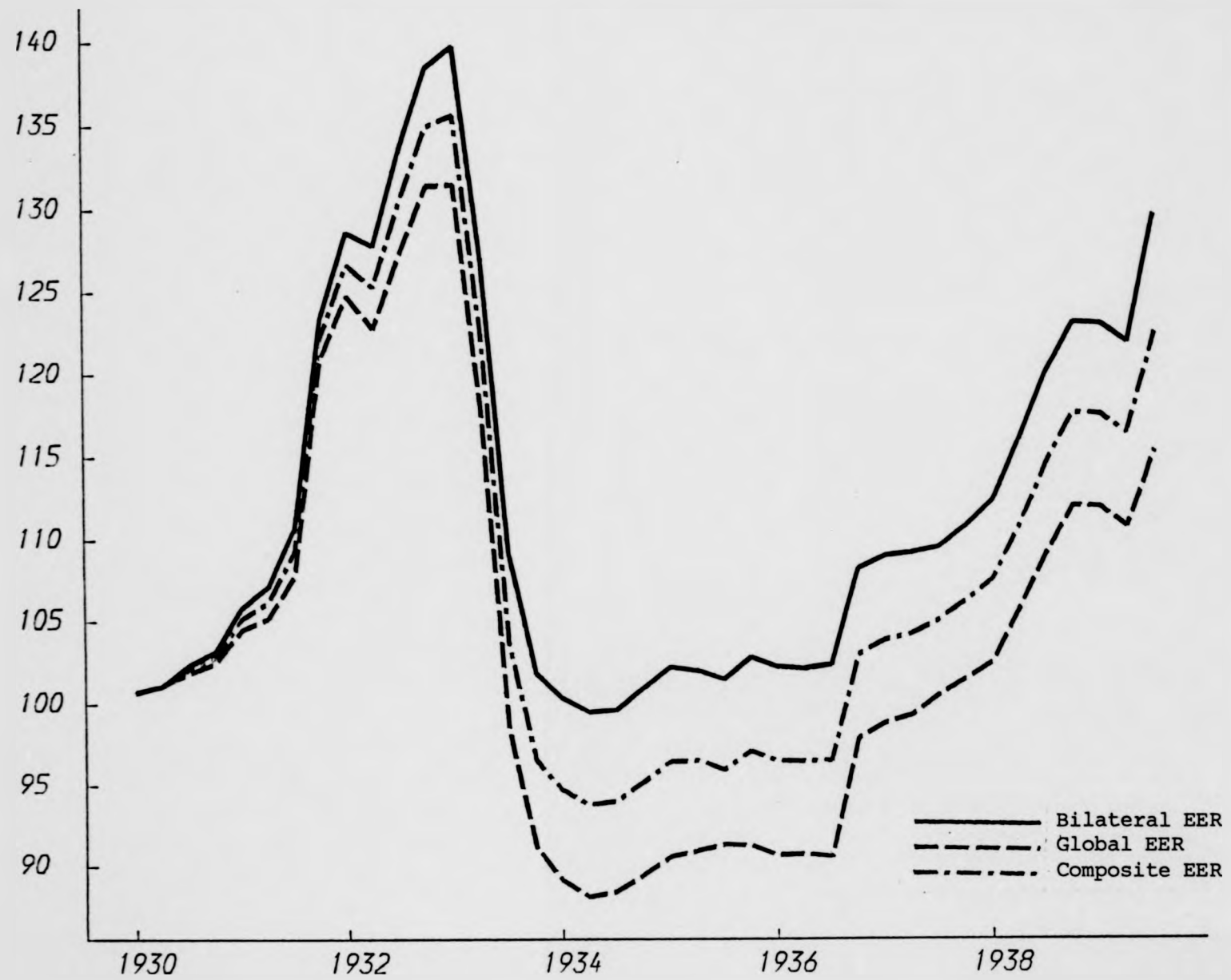
FIG. 10.2   U.S. EER's COMPARED
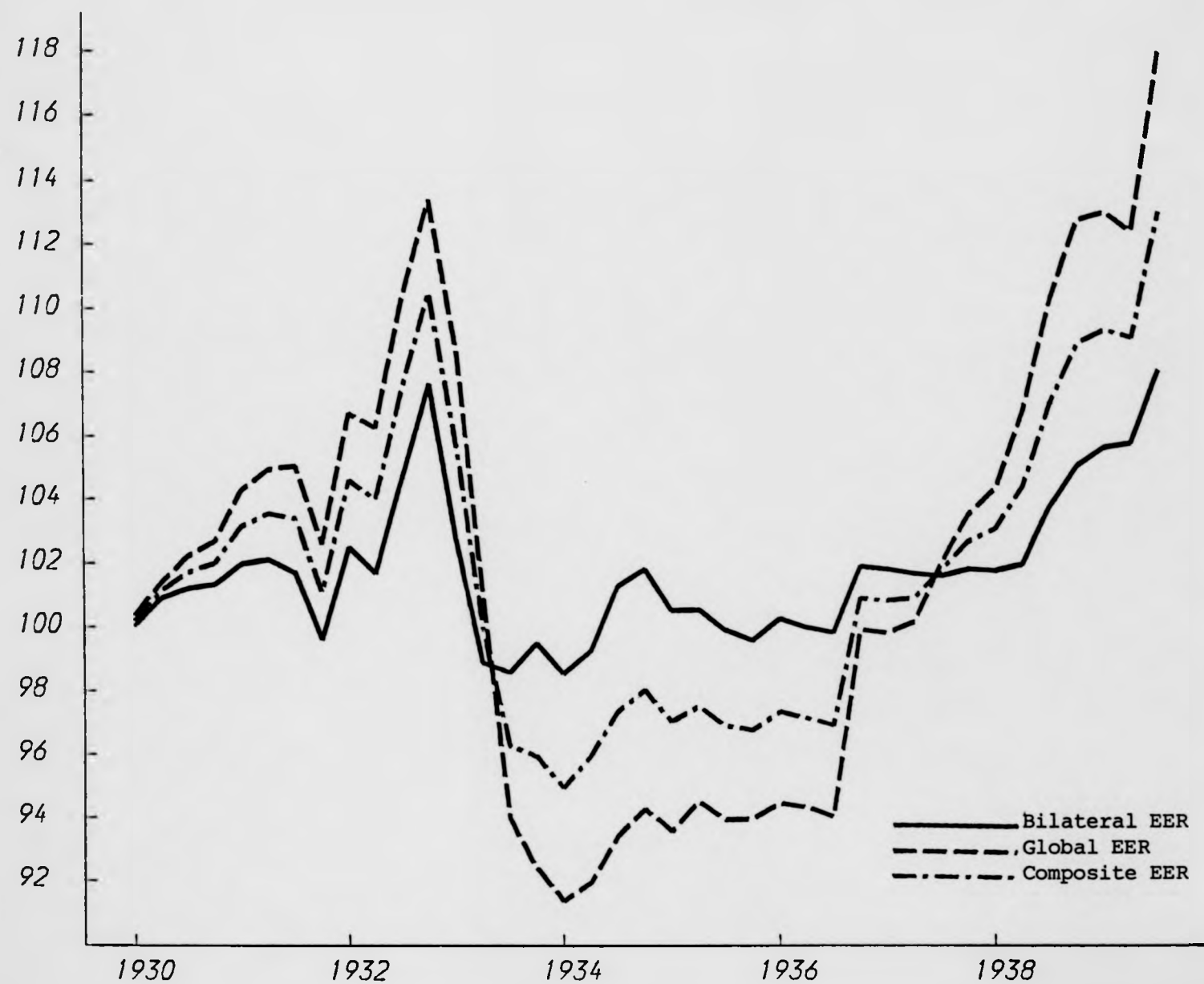
FIG. 10.3   CANADIAN EER's COMPARED
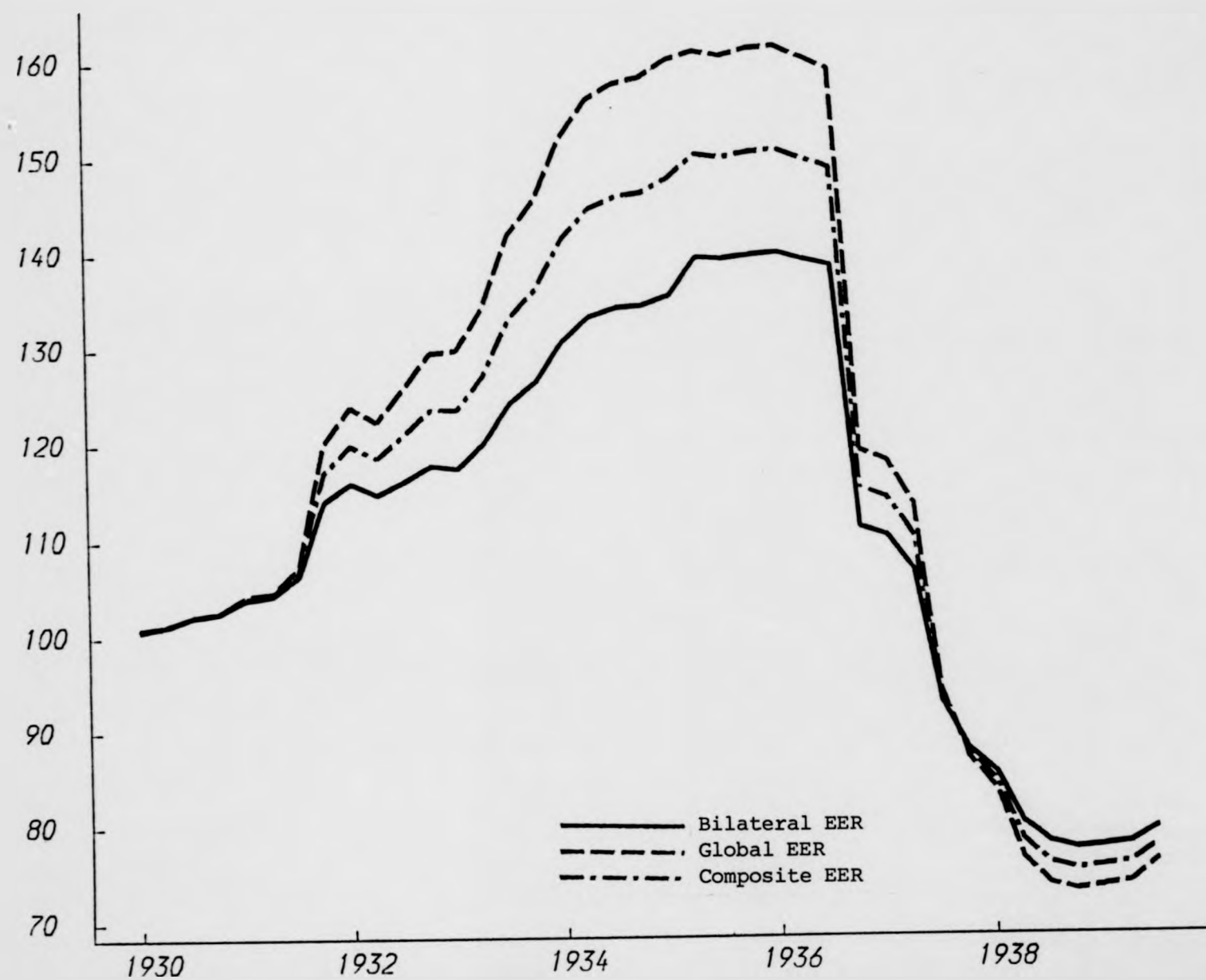
FIG. 10.4   FRENCH EER's COMPARED
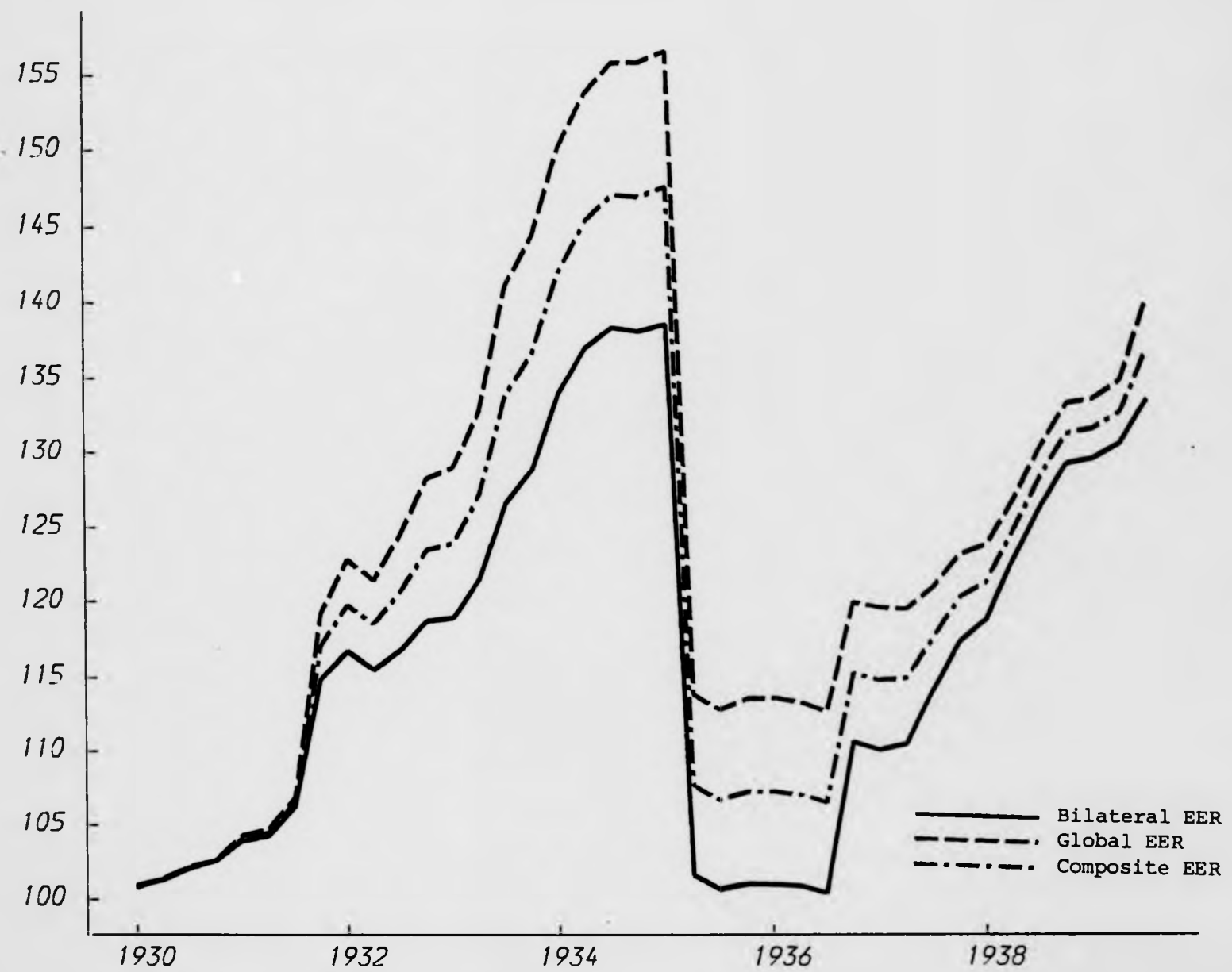
FIG. 10.5   BELGIAN EER's COMPARED
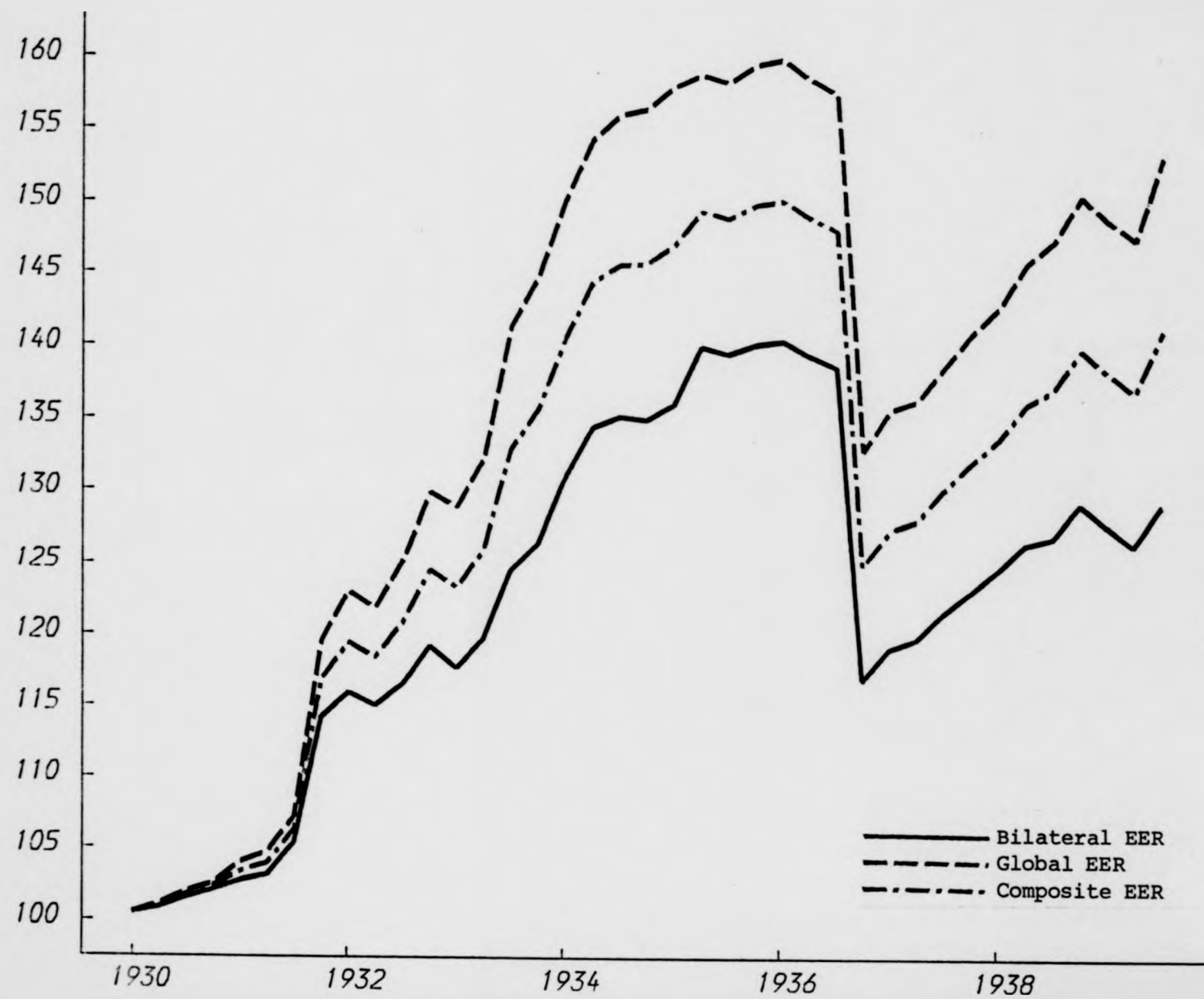
FIG. 10.6   DUTCH EER's COMPARED
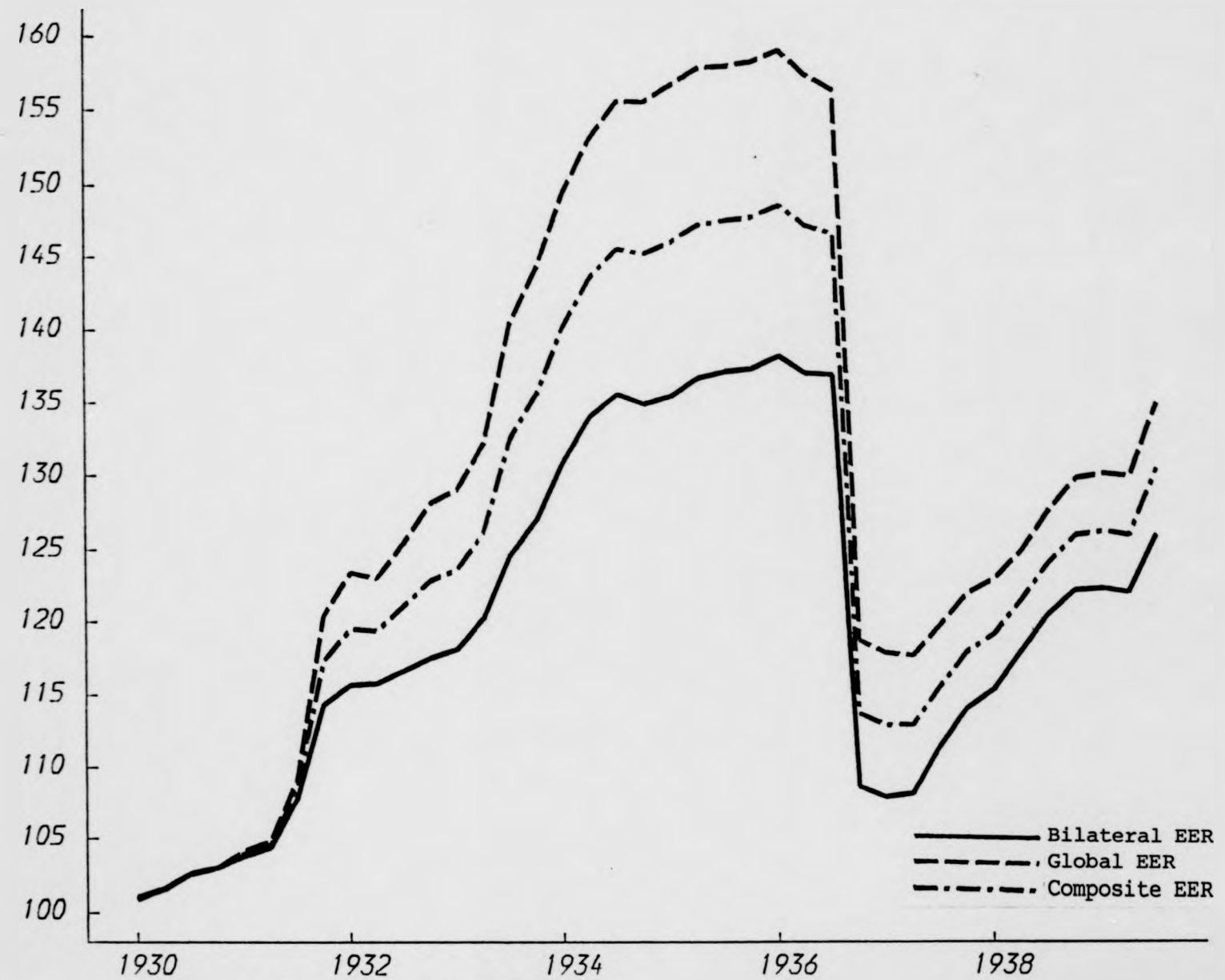
FIG. 10.7   SWISS EER's COMPARED

However, there is an appreciable difference in absolute
levels between the pound's average global and average bi-lateral
indices (Fig. 10.1C) in the period 1932-36, in which the latter is
significantly higher. In particular, the bi-lateral index suggests
that the pound had appreciated back to its 1929-30 level by mid-1934
whereas the global index indicates that the pound stayed at least 5%
below its 1929-30 level (and nearly 10% below its pre-devaluation
level) until as late as mid-1937. The first possibility that comes
to mind is that the former may give a larger weight to the U.S.A.
which devalued its currency by approximately a third in 1933-4, but
this does not seem to have been the case since, in fact, it is the
global index which gives the U.S.A. the larger weight. A more likely
explanation is to be found in the fact that the bi-lateral system
allocates higher weights to the Commonwealth countries, three of
which, [6] substantially depreciated their currencies against the
pound early in 1933.

Three additional indices were also calculated for the pound: a
Paasche index and two indices in which the U.S. weight was raised to
take account of the possibility that the U.S. should be given a higher
weight than indicated by trade shares alone because this did not
adequately reflect the dollar's importance. The results are pre-
sented in Table 10.1 on an annual basis.[7] It is clear that the
Paasche index is very similar to the Laspeyres (composite) index and
also that increasing the American weight (even from 20.063 to as high
as 35.251) had little effect. Furthermore the point at which the
pound regained its 1929-30 level is much the same for all four indices.

The remaining six countries' EER's are presented and compared

TABLE 10.1:   ALTERNATIVE INDICES OF THE POUND'S EER

	Composite (Laspeyres)	Paasche[1]	A1[2]	A2[3]
1929/30	100	100	100	100
1931	100.08	100.56	99.40	98.78
1932	86.75	86.73	85.29	83.97
1933	91.28	92.07	90.82	90.40
1934	95.92	96.36	96.70	97.39
1935	95.44	95.91	95.99	96.48
1936	97.51	97.98	97.99	98.42
1937	100.75	100.88	100.84	100.92
1938	105.05	104.57	104.61	104.21
1939[4]	105.35	104.43	104.43	103.60

Notes: 1.   Weights for 1931-2 based on 1928 data, for 1933-6 on
             1935 data and for 1937-9 on 1938 data.

         2.   U.S. weight = 28.056; all other weights are $^9/10$ of
             their value in the composite index.

         3.   U.S. weight = 35.251; all other weights are $^9/10$ of
             their value in A1.

         4.   January-August only.

in Figs. 10.2-10.7.   Unlike the pound, it is the global index that is

the highest in the case of the four gold bloc currencies (with the

exception of France after the third quarter of 1937).   This indicates

the absence of any general tendency of either global or bi-lateral

indices to be highest (which is not surprising) and, more importantly,

suggests that the bi-lateral version is least variable: the multi-

lateral pound was depreciated during most of the 1930's whilst the

gold bloc currencies were appreciated and, what seems to emerge, is

that the bi-lateral version of the former depreciated less and those

of the latter appreciated less (than the global versions). Similarly,
the Canadian bi-lateral index is the least variable, rising less than
the global in appreciated periods (early and late 1930's) and falling
less during the depreciated period (mid-1930's). The only ambiguous
case is the U.S. dollar whose bi-lateral index remains above the global
index even during appreciated periods. However, a comparison of
standard deviations (Table 10.2) does show the bi-lateral version
was (marginally) less variable. Furthermore, Table 10.2 also gives
more precise (statistical) evidence of the lesser variability of
bi-lateral indices generally.

TABLE 10.2: STANDARD DEVIATIONS OF EFFECTIVE EXCHANGE RATES

	U.K.	U.S.	Canada	France	Belgium	Holland	Switzerland
Composite Index	6.421	12.145	4.604	25.714	14.303	15.912	15.457
Bi-lateral Index	5.337	11.928	2.283	20.769	12.828	12.368	12.039
Global Index	7.300	12.669	7.173	30.718	16.140	19.562	18.944

This lesser variability is interesting in that, whilst both
global and bi-lateral indices have drawbacks, an argument can be pre-
sented for preferring the latter in the 1930's. Although it has been
argued (in Chapter 9) that acts of deliberate policy should be ignored
and EER's should simply reflect the effect of exchange rate changes on
the balance of payments, the high level of protection in the 1930's may
be so important as to demand attention. Since protection, and later its
relaxation, were pursued in such a way as to give (usually reciprocal)

preferential treatment to major trading partners then any exchange rate of the latter was likely to have more effect on the trade balance of a given country than a similar change by a trading country important in global terms but not bi-laterally (and therefore not a recipient of preferential treatment). Hence bi-lateral indices are more important and the fact that they exhibit lesser variability emphasises the inference (drawn below) that multi-lateral exchange rates are more "stable" than bi-lateral exchange rates in this simplistic sense.

However, such an argument is fairly tenuous and probably only applicable to the 1930's. Consequently, the most striking features of Figs. 10.1-10.7 remain the fairly large differences between bi-lateral and global indices in terms of levels and similarities in terms of trends. In the absence of any theoretical justification and on the basis of empirical evidence suggesting that the most accurate EER lies somewhere between the two,[8] the composite index is preferred. Nevertheless, the difference in levels of the different types of index should be remembered: it is much safer to deal with trends and examine levels only insofar as a range is being considered and this range is clearly above or below something else (or at least most of it is). For this reason the composite index, when compared with bi-lateral exchange rates in Figs. 10.8-10.14, is flanked by its upper and lower limits (based on the highest and lowest values of all twelve indices calculated) and, although something will still actually be said about the levels of the composite indices, such observations should be treated with caution.

(III)

The (composite) EER's and major bi-lateral exchange rates are compared in Figs. 10.8-10.14. There are two general points which might
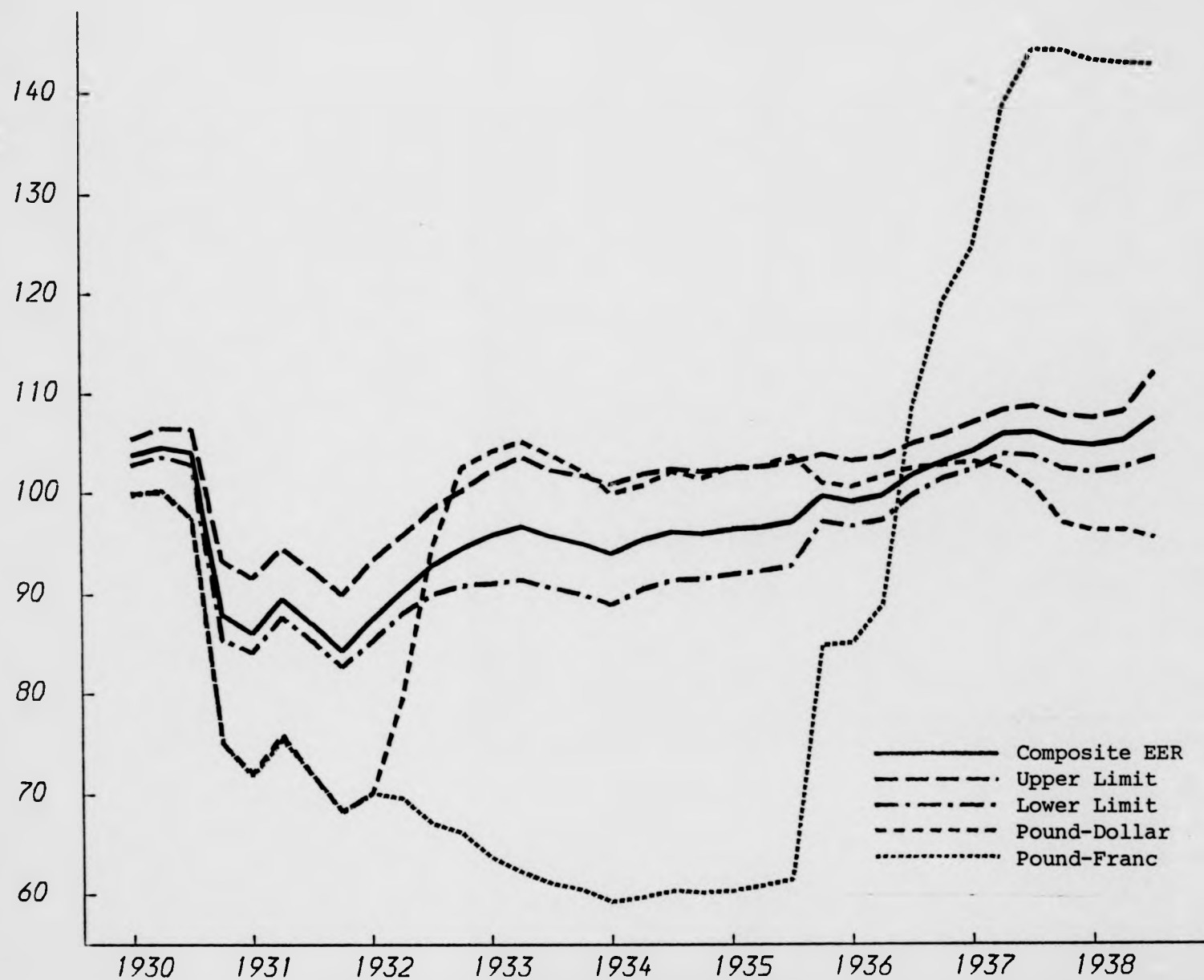
FIG. 10.8   U.K. BILATERAL AND EFFECTIVE EXCHANGE RATES
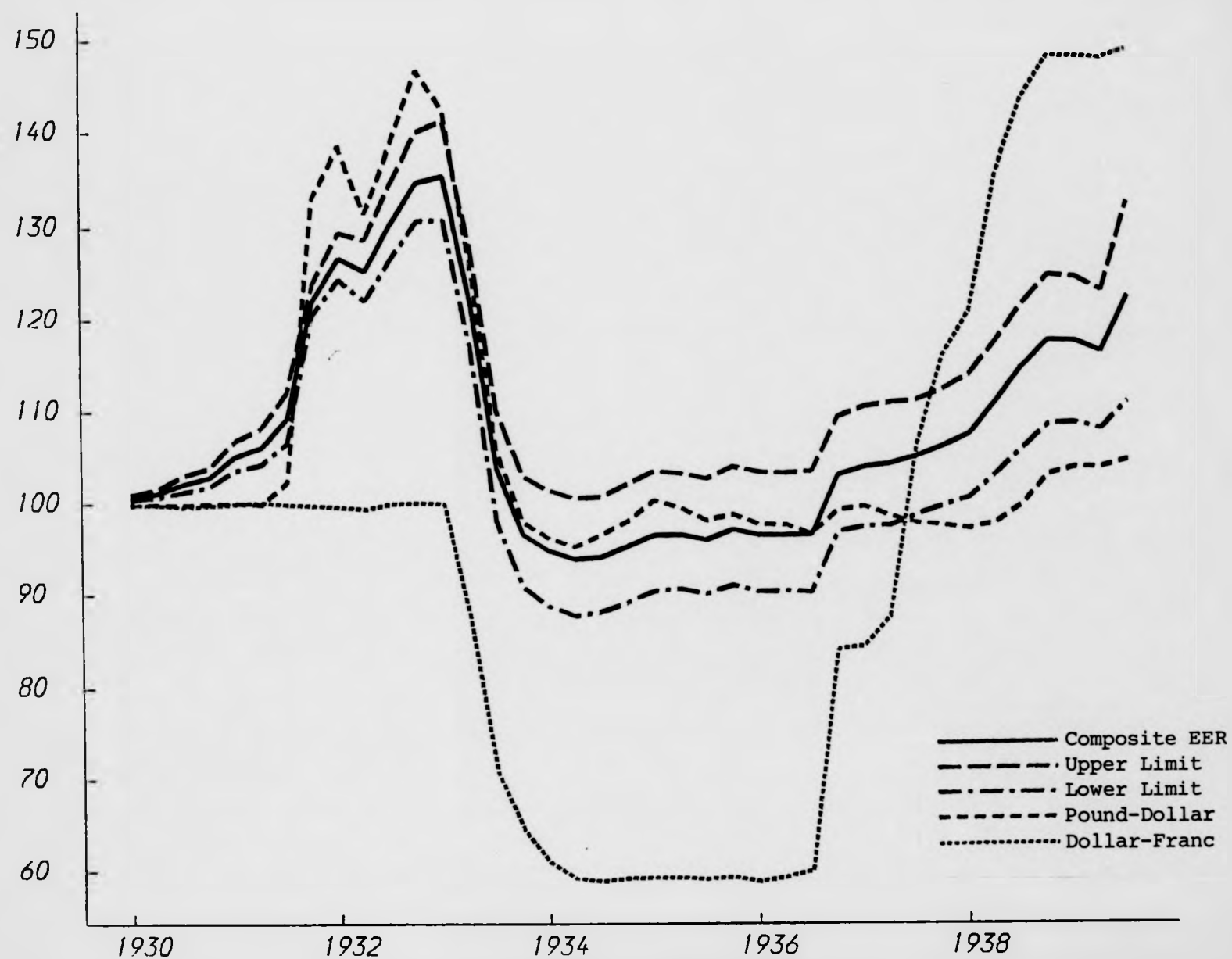
FIG. 10.9   U.S. BILATERAL AND EFFECTIVE EXCHANGE RATES
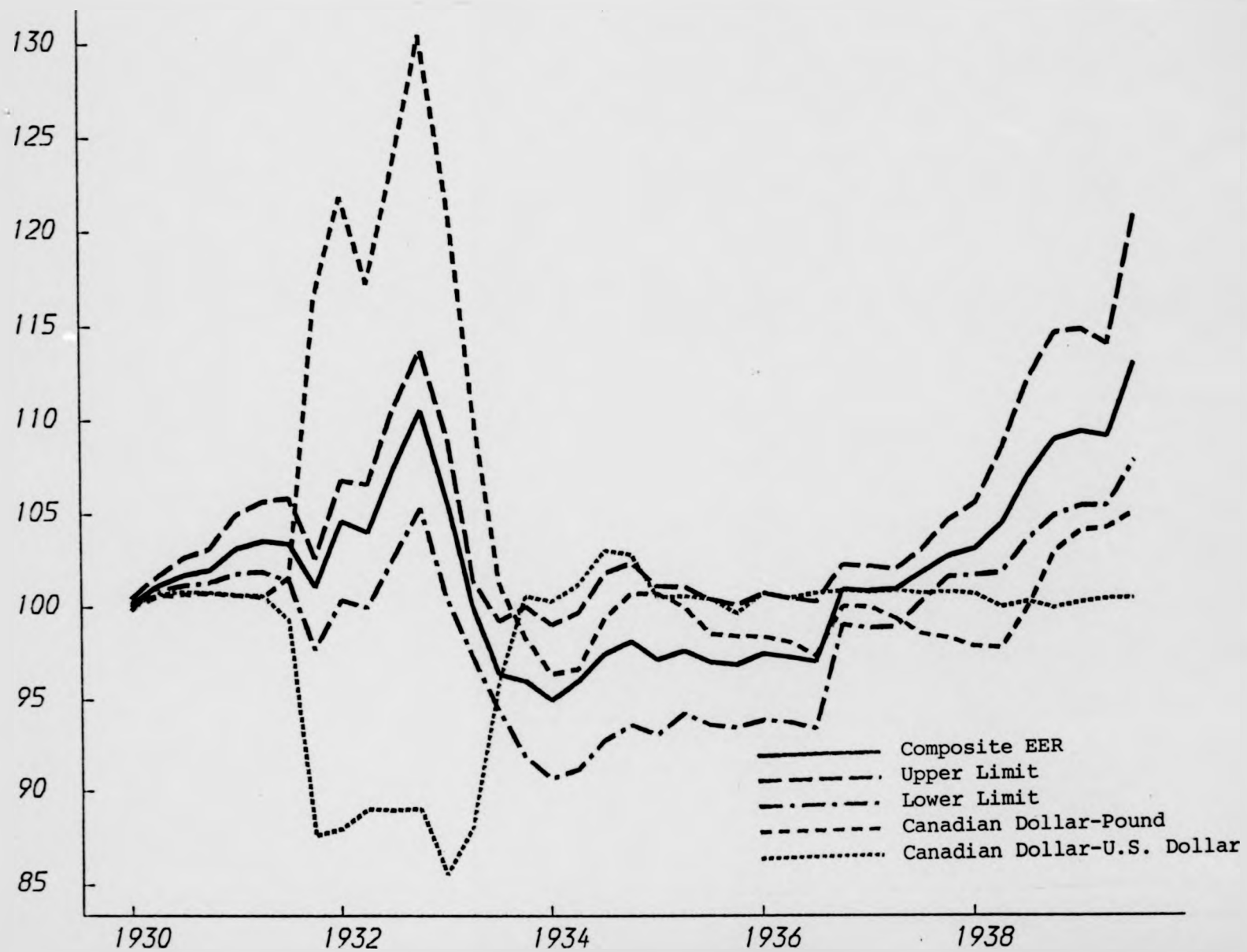
FIG. 10.10   CANADIAN BILATERAL AND EFFECTIVE EXCHANGE RATES
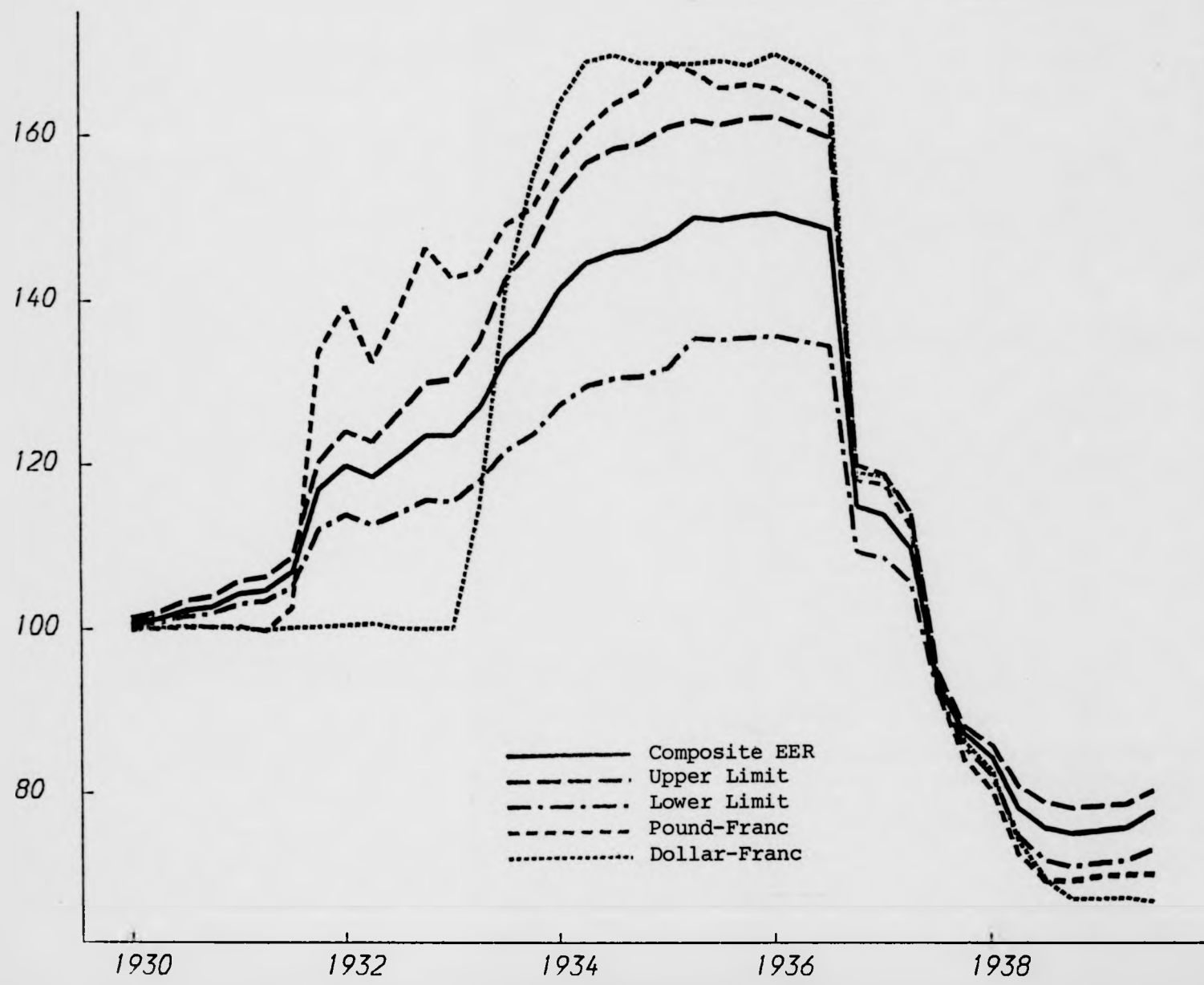
FIG. 10.11   FRENCH BILATERAL AND EFFECTIVE EXCHANGE RATES
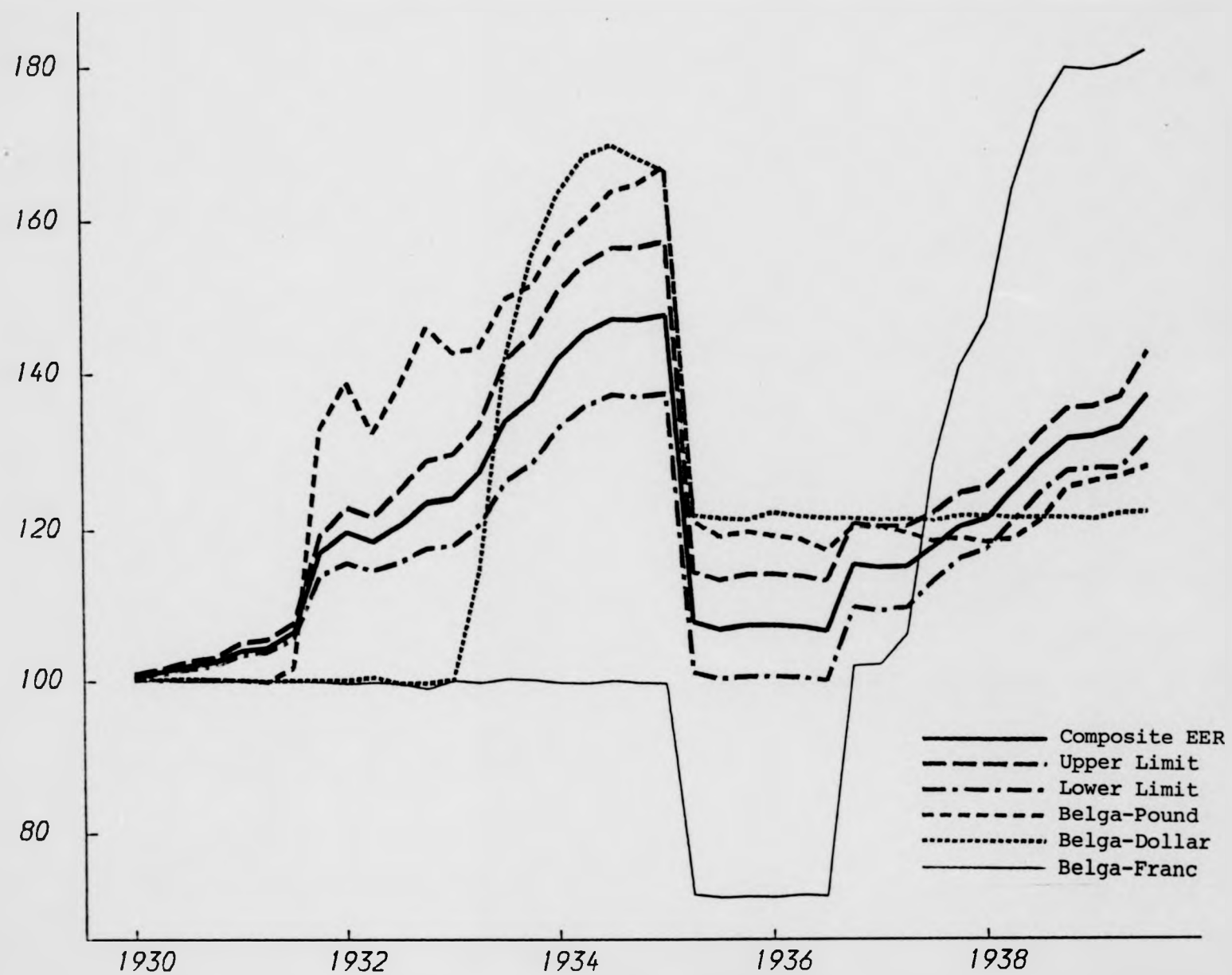
FIG. 10.12   BELGIAN BILATERAL AND EFFECTIVE EXCHANGE RATES

Legend:
— Composite EER
— — · Upper Limit
— · — · Lower Limit
— — — Belga-Pound
·········· Belga-Dollar
——— Belga-Franc
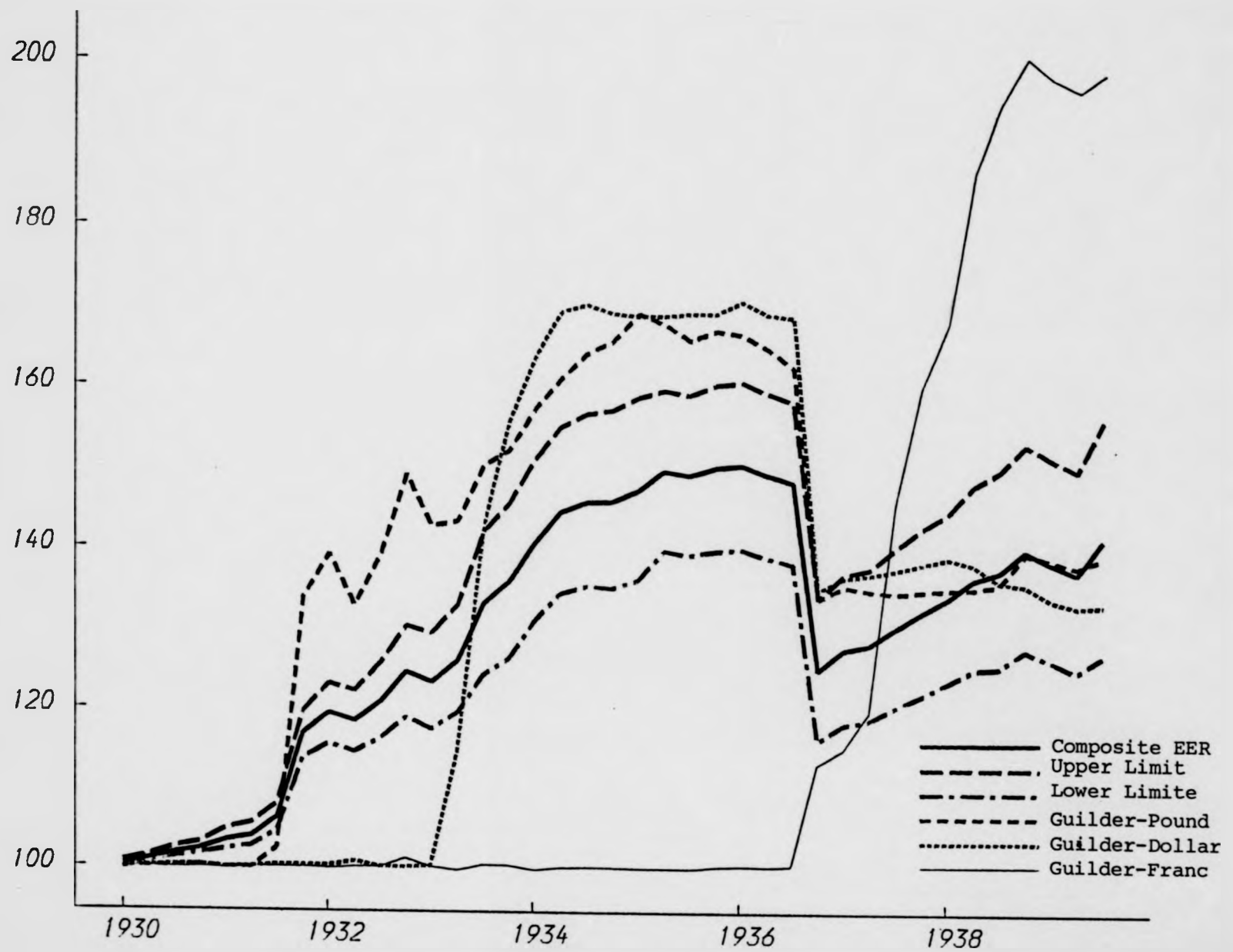
FIG. 10.13   DUTCH BILATERAL AND EFFECTIVE EXCHANGE RATES
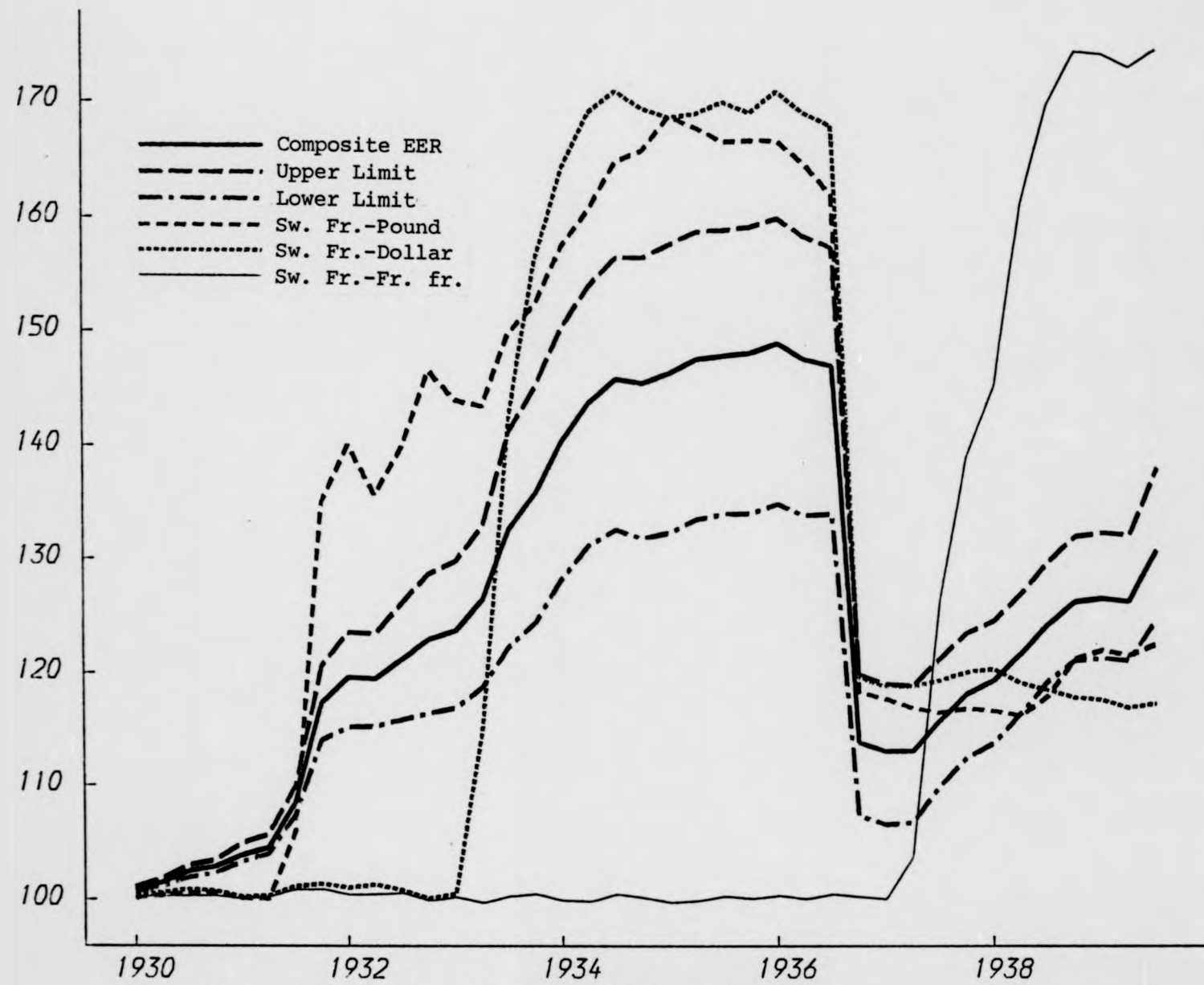
FIG. 10.14   SWISS BILATERAL AND EFFECTIVE EXCHANGE RATES

usefully be made: firstly, and most obviously, the EER's of all
seven currencies exhibit much less variability than the bilateral
rates and secondly, six of them show a tendency to appreciate from
the end of 1936 onwards,[9] with the exception being the French franc
(whose depreciation in 1936-38 obviously contributed to the appreciation
of the others). A possible implication of these appreciations is that,
in the absence of WW2, overvalued exchange rates may once again have
become a problem. Of course, this is a fairly tentative inference,
since there may be good reasons for the appreciations, but the rise
in most EER's in the late 1930's is still quite striking and worthy
of comment.

However, it is the other general characteristic - the lesser
variability of the EER's - that is probably most important. This is
because there is some tendency to treat exchange rate variability
and instability as being the same thing. That this is incorrect is,
of course, central to the present study and the stability (more
properly defined) of EER's is taken up in the next chapter; but, if
this incorrect definition of stability were accepted, then it is clear,
both from an examination of Figs. 10.8-10.14 and from a comparison of
the standard deviations (Table 10.3), that EER's were relatively
"stable" in the 1930's compared to bilateral exchange rates and so

TABLE 10.3: <u>STANDARD DEVIATIONS OF BILATERAL AND MULTILATERAL EXCHANGE RATES</u>

EXCHANGE RATE OF → AGAINST ↓	U.K.	U.S.	Canada	France	Belgium	Holland	Switzerland
Composite Index	6.421	12.145	4.604	25.714	14.303	15.912	15.457
Pound	–	14.968	8.535	35.194	19.515	21.943	23.914
U.S.Dollar	11.479	–	4.959	36.638	21.739	27.568	28.129
French franc	30.534	29.232	–	–	32.579	36.205	26.590

Nurkse's contention of extreme exchange rate volatility (based on
the latter) loses much of its force when EER's are examined.

In addition to these general points, some specific observations
relating to individual currencies might be of interest. In the case
of the pound, it would seem that the tendency to concentrate on the
pound-dollar exchange rate has not only led to an overstatement of
the variability of the pound but has also produced a sort of contra-
diction in discussions of the effects of the 1931 devaluation in much
of the literature: while the existence of the gold bloc and the deflation
required by its members to maintain the gold standard is acknowledged,
the potential effects on British trade and the balance of payments, and
the general exchange rate implications of these countries maintaining
their currencies at the old gold parities are not brought out; the
effects of the British devaluation are usually dismissed as being over
by 1933.[10] However, the EER (composite index) suggests that the
pound remained 4-5 per cent below its 1929-30 level and 8 per cent
below its level in August, 1931 until well into 1936. Thus it would
seem that concentration on the pound-dollar exchange rate has led to
the benefits of freeing the exchange rate and their role in Britain's
recovery being overstated in the period 1931-33 and understated in
1934-36.

The contention that the pound remained below its 1929 value is
strongly supported by two other independently calculated sterling EER's
that have recently become available. The three alternative indices
are compared in Table 10.4. It is quite clear from the Dimsdale and
Andrews indices that the pound's EER remained considerably below its
1929 level in the 1930's. However, whilst these two indices are very
similar to each other, they are rather different to the composite index
presented here and this requires some explanation.

TABLE 10.4: ALTERNATIVE STERLING EFFECTIVE EXCHANGE RATES (1929-38)

	Redmond (Composite)	Dimsdale	Andrews
1929	100	100	100
1930	101.9	99.6	100
1931	101.3	93.7	91
1932	87.7	75.2	77
1933	92.3	77.0	77
1934	97.1	75.4	81
1935	96.6	74.5	77
1936	98.7	77.7	79
1937	101.9	84.7	86
1938	106.4	86.9	91

Sources: (1) Redmond: the 1929 based composite index (for comparability) and not the 1929-30 version discussed in the text.

(2) Dimsdale: from Dimsdale (1981) Table 3, p. 317 and Table 9, p. 333.

(3) Andrews: approximate values from a graphical presentation of an index calculated by B.P.A. Andrews (Balliol College, Oxford); I am indebted to Mr. Andrews for his permission to refer to this unpublished material.

It would be possible to adopt a defensive posture and to attempt to criticise these alternative indices: Dimsdale uses multi-lateral weights thereby ignoring important bilateral relationships and his data for calculating weights is taken from only one year (1929), even though trading patterns clearly changed in the 1930's following the shift to protectionism; Andrews includes only five countries, uses bilateral weights (and so ignores third country effects) and his use of a Paasche index can also be criticised.[11] However, the index presented here could also be criticised on various technical grounds and to

pedantically defend it would not be a particularly useful exercise.
It is quite clear that the main reason for the differences in levels
between the indices is the inclusion of a large number of colonies
and primary producers in the composite index, calculated here. The
arguments for and against this practice have already been discussed.[12]

Ultimately the differences in Table 10.4 may well stem from
the initial definitional problem of EER's: how an EER is constructed
depends on its purpose. An EER required to examine changes in com-
petitiveness (such as that of Andrews) should quite rightly be based
on countries which produce mainly manufactures but in calculating a
"general purpose" EER (such as that presented here) the inclusion of
at least some primary producers can probably be justified. To this
extent then, the EER's presented in Table 10.4 are not "competitors"
but represent different "solutions" to the same "problem" (how to
measure exchange rate changes multi-laterally) and it is useful to
consider a range of EER's for a given country, during a given period,
using different weighting schemes and different countries. It is
therefore encouraging to note that the main inferences drawn from the
composite index for the pound could equally well be drawn from Dimsdale's
and Andrews' indices.

This is especially true of the tendency for the pound to remain
below its 1929-30 level and also, to a lesser extent, of the other
interesting feature of the pound's EER, namely its steady upward trend
(common to composite, global and bilateral indices after 1932). This
may shed some light on the widely held belief that the EEA was holding
the pound down in the 1930's.[13] On the one hand, this could be taken
as an indication that the EEA was simply doing its job of smoothing out
the external value of the pound; on the other, it could suggest that

had not the EEA intervened then the pound would have quickly risen to its old level or above.[14] Certainly there were clear motives for holding the pound down in terms of boosting the export trades and freeing Bank Rate from its external responsibilities to allow a "cheap money" policy to be pursued.

Some additional evidence is provided by an examination of the capital inflow into Britain in the 1930's. In the period 1931-37 official gold holdings increased by approximately £600 million, sterling balances increased by £350 million and there was, in aggregate, a (net) current account deficit of £270 million; this implies a capital inflow of the order of £520 million.[15] At the same time, there was a total increase in new overseas issues of about £400 million[16] which indicates a gross capital inflow of nearer £900 million. This large capital inflow, combined with only a moderate appreciation of the pound, does lend some support to the hypothesis that the pound was being deliberately held down. The EER does not actually prove anything in this respect but it does indicate that while the EEA was dealing in the few main currencies in which it operated, the pound, on average, was appreciating against all other currencies; thus, there was a much stronger motive for holding the pound down than is indicated by simply examining the pound-dollar exchange rate.

Thus the calculation of a sterling EER and the data presented above provide both a motive for and evidence of an official attempt to hold sterling down. However, although this is highly suggestive, it is hardly conclusive and so it may be appropriate, at this point, to digress briefly and consider more directly how the EEA's activities in the 1930's should be interpreted. This was briefly examined in chapter 4 (appendix) where neither contemporary and more recent accounts

of the EEA's early years nor the econometric tests of Hudgins and Ozmun[17] were found to provide any direct evidence of competitive depreciation in the sense of the EEA and another exchange fund each trying simultaneously to depress the value of its currency against that of the other. Moreover, it was further argued that, although the EEA may have sometimes deliberately prevented sterling appreciation, this was incidental rather than deliberately aggressive in that it was a bi-product of internal policy rather than a major policy in itself.[18]

The views expressed in three recent examinations of the EEA in the 1930's[19] (two of which had access to official sources) would suggest that this conclusion is perhaps a little too kind to the British authorities. While Sayers is not directly concerned with the motives behind official intervention, the impression given by his account of events is that the EEA did, on occasion, do rather more than simply smooth out trends in the pound. It is true that the pound was supported as well as depressed at certain times[20] and, indeed, there were occasions when intervention was precluded by lack of funds[21] but the general tenor of Sayers' comments appears to be accepted by Howson (both implicitly and explicitly) in the only extensive study of the EEA's activities in this period:

> "...the U.K. authorities in the 1930's certainly had exchange rate targets..." (22)

> "...in the mid-1930's...the authorities intervened heavily whenever the pound threatened to rise..." (23)

However, Howson's principal conclusion is rather more liberal:

> "At various times...the EEA's management of sterling in the 1930's included aggressive intervention../etc/..Yet of none of these episodes can it be said that the EEA would...have violated the principles recently adopted by the IMF /designed to prevent aggressive intervention7." (24)

(page 358B follows)

A rather less generous view is taken by Dimsdale who, whilst accepting Howson's general position, nevertheless concludes:

> "It appears, however, that in some years, such as 1932 and 1936, intervention went beyond the smoothing of market fluctuations and that a deliberate attempt was made to prevent the appreciation of sterling". (25)

Although these views expressed by Howson and Dimsdale are, on the surface, at variance, the difference between them would seem to be one cf emphasis rather than substance. It is clear that intervention of a competitive nature - in the sense of preventing an appreciation of the pound that would otherwise have occurred - did take place from time to time but such activity was not as endemic as is often suggested (or seemingly was believed to be by many Americans at the time) [26] and, by any standard, to portray the EEA in its early days as primarily a device to competitively depreciate the pound seems unfair. [27]

The major implication of the EER's of the four gold bloc currencies is that they were not as overvalued in the 1931-35/6 period as their bi-lateral exchange rates against the major currencies suggests. [28] This is an interesting, although on reflection unsurprising observation. The reason why the effective rates were lower than the main bi-lateral rates is that a fairly large proportion of their trade was with each other and with colonies. [29] Nevertheless,

this point needs to be made and the appreciation of these currencies
in the first half of the 1930's should clearly not be overstated.
These lower effective rates would suggest that the decline in exports
of the gold bloc countries should be blamed less on a high exchange
rate and more on protection and furthermore that competitive
depreciation was not as much a problem in the 1930's as is often
implied.

In the second half of the 1930's the paths of the gold bloc
countries' exchange rates diverge, particularly that of France.
Nevertheless two generally applicable observations can be made: firstly,
and fairly obviously, their EER's depreciated by rather less than their
major bilateral exchange rates (against the pound and the dollar)[30]
when they were finally forced to abandon their old gold parities;
this is not surprising as the former take account of exchange rates
with other members of the gold bloc whose currencies were also de-
preciating and this parallel movement is, of course, an important
reason why effective rates did not appreciate so much in the first
place. This smaller movement of effective rates would imply that
exchange rate depreciation had a lesser role in stimulating recovery.
However, it is not clear that this is the case because the second
observation would seem to imply the opposite: despite their greater
decline the bilateral rates still remain well above their 1929 levels and
their levels immediately preceding the first major breach of the inter-war gold
standard (August, 1931) and the onset of depression in Europe but
the effective rates, whilst not dropping back to their earlier levels,
came rather closer to doing so (especially in relation to their August,
1931 levels). Consequently this latter point would suggest that the
exchange rate did perhaps play a greater role in stimulating recovery
in these countries than bilateral rates suggest.

This is particularly true of Belgium whose EER dropped to
within 8% of its 1929 level when the belga was devalued in March,
1935 and, in fact, almost all the way back to its August, 1931 level
(within 2%) whilst the Belgian bilateral exchange rates against the
pound and the dollar remained some 20% above their August, 1931
(and 1929) levels. Switzerland also provides a good example of
this: its effective rate fell to within 14% of its 1929 level in 1936
and was only 7% above its August, 1931 level compared to bilateral
rates some 18-19% above their earlier levels. Moreover, although
both Dutch bilateral and effective rates remained well above their
earlier levels, in spite of large depreciations, the argument would
seem to apply with equal force in this case also since the latter
dropped within 17% of its August, 1931 level whilst the former remained
more than 30% above their levels in the corresponding period. The
difference between the relationships of the levels of the French
effective rate and French bilateral rates after September, 1936 with
those in the earlier periods is less marked but is appreciable even
here: in October, 1936 the effective rate was less than 10% above
its August, 1931 level and the bilateral rates 18-19% higher although
the fact that both French effective and bilateral exchange rates soon
fell well below their earlier levels undermines the validity of this
general argument as far as France is concerned. In fact the French
effective and bilateral exchange rates move fairly closely together
from late 1936 onwards and the latter is, in this particular case, a
reasonably good proxy for the former in the 1936-9 period.

A final point, relating mainly to the three smaller gold bloc
countries, is that there was a marked upward trend in their effective
rates after 1936 which was also true of the two North American effective

This is particularly true of Belgium whose EER dropped to within 8% of its 1929 level when the belga was devalued in March, 1935 and, in fact, almost all the way back to its August, 1931 level (within 2%) whilst the Belgian bilateral exchange rates against the pound and the dollar remained some 20% above their August, 1931 (and 1929) levels. Switzerland also provides a good example of this: its effective rate fell to within 14% of its 1929 level in 1936 and was only 7% above its August, 1931 level compared to bilateral rates some 18-19% above their earlier levels. Moreover, although both Dutch bilateral and effective rates remained well above their earlier levels, in spite of large depreciations, the argument would seem to apply with equal force in this case also since the latter dropped within 17% of its August, 1931 level whilst the former remained more than 30% above their levels in the corresponding period. The difference between the relationships of the levels of the French effective rate and French bilateral rates after September, 1936 with those in the earlier periods is less marked but is appreciable even here: in October, 1936 the effective rate was less than 10% above its August, 1931 level and the bilateral rates 18-19% higher although the fact that both French effective and bilateral exchange rates soon fell well below their earlier levels undermines the validity of this general argument as far as France is concerned. In fact the French effective and bilateral exchange rates move fairly closely together from late 1936 onwards and the latter is, in this particular case, a reasonably good proxy for the former in the 1936-9 period.

A final point, relating mainly to the three smaller gold bloc countries, is that there was a marked upward trend in their effective rates after 1936 which was also true of the two North American effective

rates and has already been discussed. Thus to summarise, as far as
the four gold bloc countries are concerned, the EER's indicate,
firstly, that reference to bilateral exchange rates overstates the
extent (and therefore influence) of the appreciation of their
currencies in the 1931-35/6 period and secondly, that the latter
do not show how close the exchange rates of these countries came to
returning to their early 1931 (and to a lesser extent 1929) levels
following their devaluations in 1935/6.

The major divergences between the U.S. dollar's EER and its
exchange rate against the pound (its main bilateral rate) occur in
1931-33 and 1937-39 with it being lower in the former period and higher
in the latter. As with the gold bloc currencies the lower level of
the effective rate in 1931-33 would indicate that any role the exchange
rate had in contributing to the depression was rather less important
than the dollar-pound exchange rate suggests. Of more importance
perhaps, is the relationship between the exchange rate and the recovery.
It has been argued that the dollar devaluation in 1933-4 was a de-
liberate attempt to stimulate internal recovery on the basis of the
(mistaken) belief that there was a direct relationship between the
price of gold and internal commodity price levels and that if one
rose so would the other. The same author goes on to argue that prices
rose for different reasons and that the existence of beneficial effects of
devaluation on internal recovery (in terms of prices and employment)
is rather debatable.[31] The effective rate would seem to add some
measure of support to this in that the actual depreciation of the
dollar in effective terms (from March, 1933 to January, 1934) was
less (29.5%) than the dollar-pound rate suggests (32%). On the other
hand in the 1934-6 period the effective rate maintained a value of

between 3% and 6% less than its 1929 level and as much as 11-14% below its August, 1931 level which may well have facilitated American recovery.

Finally, it is interesting to note the movement of the effective rate during the 1937-8 recession. In September, 1937 this stood at 105.2 and then rose progressively until it reached 113.3 in July, 1938. What, if any, contribution this made to the recession may be doubtful but it is nevertheless true that the possibility of the exchange rate having any effect is not made clear by referring only to the bilateral rate which remained fairly stable, at a level of 97.9 in September, 1937 and 98.5 in July, 1938 varying between 96.8 and 98.5 in this eleven month period. Moreover, whilst it is true that the effective rate continued to rise even after the upturn in the second half of 1938, this rise did not match the 7.7% increase of the September, 1937 to July, 1938 period reaching only 116.8 - a further rise of only 3.4% - in June, 1939 (although it had reached as high as 118.4 in January, 1939) with the effective rate not really taking off until July, 1939 (119.5) and August, 1939 (125.2) when the calculation becomes rather unreliable and distorted.

The most notable feature of the Canadian EER is its lack of variation (an issue which has already been discussed): all twelve versions fluctuated within a 30% band around the base level (+20% to -10%) whilst the composite index fluctuated within only 17% compared with as much as 55% for the two major bilateral rates. Perhaps a more important point, however, relates to the 1933-36 period when the EER was several percentage points below both major bilateral rates and, indeed, its 1929 level, giving Canada, a country heavily dependent on exports, a competitive edge on the rest of the world[32] until the 1937-39 appreciation (common to all countries except France).

The Canadian calculation is interesting because its provides
a good opportunity to take up once again the possibility of giving
the U.S. a higher weight (previously discussed in relation to the
pound). At the same time, it allows an empirical test (of sorts)
of the importance of capital flows since much of the Canadian capital
inflow came from the U.S. (and so the two issues amount to the same
thing). Canadians were acutely aware of the importance of American
capital and, indeed, its large volume (and the consequent large debt
repayments) were a major reason why the Canadian dollar only followed
the pound part of the way in its 1931 depreciation.[33] Thus U.S.
capital flows influenced the Canadian exchange rate but causation also
ran ran the other way since any depreciation of the Canadian dollar
against the U.S. dollar encouraged U.S. capital to flow to Canada
(because it became cheaper to invest there).

Both these arguments would indicate a need for a higher U.S.
weight for the Canadian EER: in the first case, if the U.S. dollar-
Canadian dollar exchange rate is being deliberately held back because
of U.S. capital flows, then it is not changing as much as it ought and
so a larger U.S. weight should be used to offset this; and, in the
second case, if a depreciation of the Canadian dollar attracts U.S.
capital then this improves the Canadian balance of payments and an
EER calculated   for general purposes should allow for this effect.

It was argued (in chapter 9) that varying the weights by
calculating different indices was one method, in the face of inadequate
data on international capital flows, of testing for the effect of using
weights based on the complete balance of payments. The Canadian case
would seem to bear out the validity of this approach while throwing
light on the influence of increasing the U.S. weight at the same time.

The effect of increasing the U.S. weight is apparent in Fig. 10.4 where the average bilateral and global indices are charted; in the former the U.S. has a weight of 51.9, in the latter 12.9.[34] Of course, this test is not strictly valid in that the weights of other countries differ also but it is highly suggestive: the effect of increasing the U.S. weight (and allowing for capital flows) would seem to be that the variability of the Canadian EER is considerably reduced. Furthermore, Fig. 10.11 implies that the effect of allowing for capital flows is also fairly minimal, at least in the Canadian case, as despite the extremely large variation of the U.S. weight (and of that of the U.K., the other main supplier of Canadian capital) in the twelve indices, the gap between the highest and the lowest of them is never more than twenty percentage points (and the trend is unaffected).[35]

Finally, it would be useful to compare the 29 country EER's calculated and presented above with the 7 country EER's calculated for regression purposes in the next chapter. The latter could be considered as indices that exclude primary producers, although it should be remembered that they also exclude numerous industrial countries (since they were calculated with a view to the availability of price data and income proxies and whether or not the exchange rates of the included countries were "free"). However, for the sake of completeness, a comparison is made in Table 10.5.

It is clear that the two EER's for each country are broadly similar, particularly in terms of trends, for all seven currencies. This is especially true of the four gold bloc countries. The other major feature of Table 10.5 is the fact that the 7 country EER's tend to be lower in all cases (probably because they exclude primary

TABLE 10.5: COMPARISON OF 7 COUNTRY AND 29 COUNTRY EFFECTIVE EXCHANGE RATES

	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
U.K. (28)	100	101.9	101.3	87.7	92.3	97.1	96.6	98.7	101.9	106.4	108.6
U.K. (7)	100	99.9	93.8	74.1	80.7	86.3	86.1	89.4	95.9	101.0	98.4
U.S. (29)	100	101.7	110.6	129.3	114.5	94.4	96.5	98.1	104.8	112.6	118.2
U.S. (7)	100	99.7	104.1	117.4	102.4	84.5	87.4	88.7	94.7	100.6	103.9
Canada (29)	100	101.3	102.8	106.6	99.5	96.5	97.1	98.1	101.6	105.8	110.1
Canada (7)	100	100.5	99.5	100.1	93.5	91.7	92.2	93.3	97.2	100.2	102.8
France (29)	100	101.7	108.2	120.7	129.9	144.5	149.5	140.9	101.1	78.4	76.1
France (7)	100	100.0	102.9	112.5	124.7	142.5	150.1	141.0	95.9	68.5	64.0
Belgium (29)	100	101.7	108.0	120.5	130.4	145.3	117.3	109.0	116.9	126.4	133.3
Belgium (7)	100	100.1	102.6	111.1	122.3	137.7	110.3	103.0	114.7	125.9	131.1
Holland (29)	100	101.4	107.6	120.8	129.4	144.0	148.7	143.0	129.4	136.6	138.4
Holland (7)	100	100.0	103.3	114.2	125.1	141.8	149.3	144.0	130.8	138.2	138.2
Switzerland (29)	100	102.0	108.6	120.7	129.5	143.6	147.2	139.0	114.9	122.7	127.2
Switzerland (7)	100	100.4	103.4	111.7	122.4	138.4	142.7	134.7	113.6	124.7	127.7

producers with depreciating currencies). As far as Canada and
the gold bloc countries are concerned, this gives further support
to the inferences drawn from the 29 country EER: in the former case,
the 7 country version indicates that the comparative edge given to
Canadian imports in the 1933-36 period was somewhat larger than
previously suggested; in the latter case, the argument that the gold
bloc currencies were not as overvalued as indicated by the major
bilateral exchange rates is reinforced (particularly for Belgium
and Switzerland).

The U.K. 7 country EER, not surprisingly, lies somewhere between
the 29 country version and the Dimsdale and Andrews EER's (discussed
above) and, as it was concluded that the latter tended to reinforce
rather than contradict the inferences drawn from the 29 country EER,
no further comment is required. The U.S. country EER is also markedly
lower and this would tend to emphasize the role of the exchange rate
in the American recovery which has been tentatively suggested. In
conclusion, the 7 country EER's would not seem to contradict any of
the inferences drawn from the 29 country EER's.

This completes the examination of some of the more obvious
implications of the movements of the seven EER's that were calculated.
To some extent this discussion is peripheral to the main concerns of
the study, but it was felt necessary to do a little more than merely
present the EER's without comment. There are numerous problems involved
in the calculations (discussed in chapter 9) and the EER's presented
here are by no means completely free of them (although data deficiencies
make some of the problems virtually unavoidable). Consequently, the
results that have been presented and the conclusions derived should
be treated with caution.

Nevertheless, some of the points made do carry some authority, since they can be derived from any of the twelve indices calculated for a particular country; for example, it has been argued that the main bilateral exchange rates overstate the extent of overvaluation of the four gold bloc currencies in the 1931-35/6 period, and this is apparent whichever variation of any particular country's EER is considered since the whole range of indices calculated - from the highest to the lowest values - lies below the main bilateral rates in all four cases. The next chapter returns to the central theme of the study and examines the extent to which EER's can be considered to have exhibited stability in the 1930's (in the sense of being determined by "economic fundamentals").

FOOTNOTES TO CHAPTER 10

1. The total value of world trade is derived by adding together
   total trade of each of the 29 countries with the other 28. (It
   would lead to incorrect weights if each of the 29 countries total
   trade with all other countries were used to calculate total world
   trade in this context).

2. All the other EER's presented here are Laspeyres indices.

3. Such a reason could be that the index was intended to reflect the
   asset value of the pound to some extent; this is a potential applica-
   tion of EER's that trade-weighted indices are not well suited for
   (see Chapter 9, n. 2) and raising the weight of the U.S. above
   that suggested by trade flows could be a first step in modifying
   trade-weighted EER's for this purpose.

4. Given the relatively small degree of this adjustment - it raises
   the EER by about 1% - it seems unimportant. In fact a 1929 based
   index was calculated (and indeed is used in the next chapter) but
   only the composite version. Therefore, in the context of the
   present chapter, it is necessary to discuss the 1929-30 based
   sterling EER's since all the indices using different weighting
   patterns, calculated for comparison, used a 1929-30 base. It
   would have been possible to recalculate all the different variations
   with a 1929 base but, as this would have had little effect on either
   the values of sterling EER's or on the ensuing comparisons, it did
   not seem worthwhile.

5. The upper (lower) limit value is the highest (lowest) value of any
   index of that family calculated. Therefore, it is not an index in
   itself since its values are not all provided by the same index.
   Consequently, the range of variation in the diagrams is, in a sense,
   overstated because no individual index deviates from the average as
   much as the upper and lower limits plotted in the graphs.

6. South Africa, Canada and New Zealand. (The combined bilateral
   rates of these countries are nearly twice as great as the combined
   global weights).

7. Monthly values are given in Appendix III.

8. This evidence was surveyed in the previous chapter. See Rhomberg
   (1976) and World Financial Markets (1978) (1979).

9. In the case of the pound this is part of a much longer period of
   gradual appreciation, beginning in early 1933. However, it was not
   until after 1936 that the pound regained and then surpassed its base
   year level.

10. For example, see Aldcroft (1977), p. 281 and Lewis (1949), p. 82.

11. See Chapter 9, Section II.

12. Ibid.

13. This possibility is extensively discussed in the appendix to
    Chapter 4.

14. This latter argument is less applicable to the Dimsdale and Andrews indices but not inapplicable: they both began a rising trend in 1935.

15. These figures are taken from Table N in the L.C.E.S.'s "The British Economy Key Statistics, 1900-1970". More recent data in Sayers (1976), Appendices, Table C, pp. 312-3 suggest a slightly lower gold and foreign currency inflow (£500 million) but larger current account deficit (£310 million). These changes do not affect the conclusions being drawn.

16. This is calculated from data given in Richardson (1967), p. 58. Aldcroft (1977), p. 264 and Sayers (1976), Appendices, p. 313 suggest a similar figure while Youngson (1968), p. 164 gives data for 1932-36 which would imply a lower figure, probably around £250 million.

17. See Hudgins (1973), pp. 220-1 and Ozmun (1976), p. 157 for their conclusions.

18. See p. 125 above. The argument is that the British authorities did not deliberately set out to depreciate the pound to make British exports more competitive and so on but, rather, having decided on a cheap money policy to stimulate internal recovery, wished to free Bank Rate from its external responsibilities and to avoid the recessionary influence of an overvalued pound (which was perceived as a major problem in the 1925-31 period). In a sense, therefore, the downward pressure on sterling was not an attempt to undervalue the pound artificially but, rather, to prevent it from becoming overvalued.

19. The EEA in the 1930's is the direct concern of Howson (1980) and is examined as part of Sayers (1976), especially vol. 2, pp. 416-30, 452-3, 463-500, 562-75, and Dimsdale (1981), pp. 329-32.

20. For example, in July - October, 1933 (Howson, 1980, p. 22) and in 1938-9 (Sayers, 1976, pp. 561-7).

21. This happened in November, 1932, as reported in Sayers (1976), p. 453.

22. Howson (1980), p. 45.

23. Ibid., p. 27.

24. Ibid., p. 56.

25. Dimsdale (1981), p. 332.

26. See Comstock (1933).

27. Sayers (1976), pp. 474-5, gives an account of an instance, in late 1936, when a suggestion to engineer a sterling depreciation deliberately was discussed and rejected.

28. This mirrors the depreciated level of the pound's EER in the same period.

29. In the composite index the combined weight of the other three gold bloc countries plus colonies was 29.02 for France, 26.48 for Belgium, 22.02 for Holland and 19.95 for Switzerland. (In the bilaterally weighted indices it was obviously higher: 42.29, 36.59, 27.51 and 21.98 respectively in the average bilateral indices).

30. This is not true of Belgium where the depreciation of effective and bilateral rates was more or less the same (26-28%) but in the other cases - France, Holland and Switzerland - the bilateral rate depreciations were respectively 5%, 5% and 10% (approximately) greater than the effective rate depreciations.

31. Arndt (1944), pp. 38-40.

32. A priori it was felt that, in the Canadian case, relative prices were of less importance than generally expected because the major determinant of demand for the main Canadian imports was income levels (Chapter 7, Section II). This would indicate that this point about extra Canadian price competitiveness is unimportant. However, the regression results presented in Chapter 7 did suggest that relative price effects were of some importance in Canadian trade.

33. See Chapter 7, Section I.

34. The range of variation of the U.S. weight is actually slightly larger when all twelve Canadian indices are taken into account: from 11.97 to 55.16.

35. All these arguments also apply to the Canadian weight in the U.S. EER, although capital flows between the two countries were obviously much less important to the U.S. than to Canada.

CHAPTER 11

EFFECTIVE EXCHANGE RATES AND STABILITY

(I)

In the preceding chapters the methodology of constructing EER's was discussed, they were calculated for the seven currencies in the study and some preliminary observations were made about their implications. The present chapter seeks to place EER's in the wider context of the thesis, specifically to examine the hypothesis that, like bilateral exchange rates (to some extent at least), multilateral exchange rates were also principally determined by "economic fundamentals". In fact, what follows can only be a first approximation in that a thorough examination of this hypothesis would require not a chapter but an extensive study in itself. The conclusions drawn will therefore be preliminary and based on fairly simple tests. There are a few studies which have carried out a similar exercise but these are mainly concerned with different time periods and confine themselves to the relationship between exchange rates and prices only.[1] The tests described below try and go a little further.

However, it would be useful to begin by considering the results of these other studies to examine, in particular, to what extent they found a relationship between exchange rates and relative prices. Those of Genberg (1978), Thygesen (1978) and World Financial Markets (1978, 1979) deal with recent periods and so only the more general conclusions are of interest here. Thygesen is summarizing the OPTICA Reports and strongly supports the contention that there is an important relationship between relative prices and exchange rates:

> "...changes in the exchange rates of EC member currencies
> during the period between the early 1960's and the mid-1970's
> predominantly reflect inflation differentials". (2)

Interestingly enough, he also concludes that:

> "Conformity to PPP was considerably closer multilaterally
> than bilaterally against the DM (Deutchemark)". (3)

The EER's are based on an eighteen country model and are consequently

very comprehensive. On the other hand the tests used wholesale prices

which are widely condemned as a biased indicator of PPP (as suggested

in Chapter 3).

Genberg's results are rather less encouraging: using a fourteen

country model to calculate EER's for the 1957-76 period and, (perhaps

ominously) consumer prices, he finds that deviations of exchange rates

were larger in the floating rate period (1973-76) and presents evidence

to suggest a bias in PPP calculations using consumer prices. Specifically

he discusses:

> "....the possibility that there has been a shift in PPP
> relationships,as measured by CPI's, due to changes in
> relative prices of traded goods combined with intercountry
> differences in the weights they are accorded in national
> indexes. The obvious candidate for such a relative price
> change would be the increase in oil prices in late 1973". (4)

Nevertheless, Genberg does concede that:

> "..../his/...evidence indicates that actual exchange rates
> are not likely to be far off their PPP levels if a simple
> adjustment for structural change is allowed for". (5)

He also admits that the period of floating examined may not be very

representative as it comprises the first four years of floating

following the collapse of the Bretton Woods system. To the extent

that relative income and trend variables can pick up structural changes

and dummy variables can capture abnormal factors following the
collapse of the gold standard, the second exercise undertaken below,
involving regression analysis, makes some allowance for Genberg's
criticism.

The World Financial Markets articles do not explicitly test the
PPP hypothesis but do calculate real EER's for the 1970's, compare
these to nominal EER's and conclude:

> "...it is remarkable that the floating rate system has
> brought so little real effective exchange rate variation..." (6)
> "the variability of effective exchange rates in real terms
> is empirically much less than the variability of the nominal
> indices...". (7)

This lack of variability of real effective rates clearly suggests a
strong relationship with relative prices. Two other points are of
interest: firstly, when EER's are adjusted for inflation differentials
the choice between the different possible weighting patterns for EER's
becomes less important as the differences become smaller; secondly,
real EER's adjusted with wholesale prices are more stable than those
adjusted with consumer prices.(8) In the present context, the former
point would appear to reduce the importance of a potentially awkward
problem whilst the latter reinforces the claim that it is important to
consider PPP tests using prices other than WP's (made in earlier
chapters).

The Dimsdale (1981) and Officer (1980) studies are of more
interest because the period they cover includes at least part of
the 1930's. This is particularly true of Dimsdale's real EER index
for the 1921-38 period (Table 11.1) since it uses the same base (1929)
as that chosen here and the nominal EER is adjusted by consumer (retail)
prices. Whilst the real EER still depreciates substantially in the

TABLE 11.1: NOMINAL AND REAL EER'S, 1929-38 (AS CALCULATED BY
DIMSDALE, 1981)

	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938
Nominal	100	99.6	93.7	75.2	77.0	75.4	74.5	77.7	84.7	86.9
Real	100	98.5	94.2	81.4	82.8	81.7	81.8	86.1	91.9	91.8

Source: Dimsdale (1981), Table 3, p. 317 and Table 9, p. 333.

mid-1930's the fact that the degree of this depreciation is much reduced,
along with the lesser variability of the real EER,[9] clearly suggests
that there was a relationship between the multilateral exchange rate and
relative prices of the type postulated here; that PPP does not hold
especially well is not surprising in view of the results presented in
Section II of the present study which indicated that relative prices,
though important, were not the only determinant of (bilateral) exchange
rates.

Officer's (1980) study is a fairly comprehensive test of the long
run PPP theory for fourteen EER's, using a variety of base periods, and
calculates PPP for a "current" period (1975) and two intervening periods
(1938 and 1963-66). Whilst his choice of price index (GNP deflator) is
methodologically sound, his EER's have a limited country coverage
(between two and six). Calculations are made using up to four different
base periods (as data availability permits) and six of the seven countries
in the present study are included. (The exception is Belgium). The
relevant results are summarized in Table 11.2. Officer's conclusions
are fairly optimistic:

"For any sample and time period the average absolute percentage
error is less than 30%." (10)

"Regression analysis suggests that deviations from PPP can be
explained in terms of structural changes in economies". (11)

TABLE 11.2: PERCENTAGE OVER (+) OR UNDERVALUATION (-) OF THE EFFECTIVE EXCHANGE RATE IN 1938 ACCORDING TO OFFICER'S (1980) PPP CALCULATIONS

Base Period Country	1879-88	1910	1905-13	1913
U.K.	+2.05	+10.42	+10.28	+5.79
U.S.	-27.03	-11.34	-9.98	-10.98
Canada		-7.63		
France			-25.56	
Holland			-22.05	-21.87
Switzerland				-1.81

Source: Officer (1980), Tables 2, 3, 4 and 5, pp. 214-7.

However, a rather less encouraging interpretation of the results for 1938 may seem appropriate: given the tendency for structural changes to become increasingly pronounced over time, the larger average absolute error in 1975 (up to 28%) than in 1963-66 (up to 16%) is perhaps to be expected; for the same reason, the error in 1938 ought to be the smallest but, in fact, it is almost the largest (up to 24%). Fortunately, although this is disturbing, it undermines any exact application of a simple PPP hypothesis rather than the hypothesis being tested here, which does not suggest that relative prices are the only determinant of exchange rates. Moreover, the structural changes involved after a world war, a major world-wide depression and the collapse of the established system for regulating exchange rate values would certainly be large; consequently, the fact that four of the six currencies in Table 11.2 apparently stayed within approximately 10% of their PPP value (ignoring the 1879-88 based U.S. calculation) might be interpreted as a "good" result.[12]

This completes a brief review of relevant empirical work.
The major conclusion would seem to be, both in a general sense and
in relation to the 1930's in particular, that multilateral exchange
rates were determined partially, but by no means only, by relative
prices. This does not contradict the view of bilateral exchange rates
taken earlier in the study. Consequently, the hypothesis that relative
prices played a role in the 1930's in determining the multilateral (as
well as bilateral) exchange rates of the seven currencies examined in
Section II is considered below. Two separate tests are carried out:
the first involves a simple PPP test and takes the form of calculations
of inflation differential adjusted (or real) EER's; the second employs
regression analysis which allows the inclusion of non-price explanatory
variables (although, because of data deficiencies, at the expense of
substantially reducing the country coverage of the EER's used as the
dependent variables).

(II)

As a preliminary to constructing a real EER it was necessary
to calculate an effective or "rest of the world" price index (using
the same countries and weights as in the EER). The real EER can then
be calculated:

Real EER = $\underline{/}$Nominal EER$/(EP/PD)\underline{/}$. 100   (11.1)

where EP = an effective (ROW) price index

    PD = a domestic price index

This variable is constructed in such a way that if PPP held exactly
then the real EER would be one hundred, if it is greater then the

multilateral exchange rate is overvalued (in PPP terms) and if it
is less then the exchange rate is undervalued; in addition the degree
of "misvaluation" is clear because the real EER is effectively the
nominal EER expressed as a percentage of its PPP value. Finally,
as in the examination of bilateral exchange rates, prices are lagged
by one month.

Two versions of the real EER were calculated for each country,
one adjusted by WP's, the other by COL indices. This creates an
immediate data problem due to limitations in the availability of price
data but, in fact, the number of countries that had to be excluded turned
out to be very small: the 29 country model used to construct EER's in
Chapter 10 was reduced to 28 countries for tests involving WP's and
24 for those involving COL indices.[13] Thus the nominal EER's were
recalculated using scaled up values of the weights used in the 29
country versions.[14] This is not quite correct as, strictly speaking,
the global "half" of the composite weights is based on a model in-
cluding the trade of the countries excluded from the 28 and 24 country
versions. However, any discrepancy is likely to be small given the
size of the excluded countries (in global trade terms) and the fact
that the results presented in the previous chapter indicated that the
weights of EER's could be varied quite substantially with little effect.

Real versions of the 7 country EER's used in the regression
analysis below were also calculated. This was desirable for several
reasons, most importantly because they are indices which are free of
primary producers and therefore any associated criticisms[15] but
also, at a more trivial level, the global half of the composite weights
are based only on trade between the seven countries thereby avoiding
the criticism of the previous paragraph.[16] The four versions of

each country's real EER are presented in Figs. 11.1-11.7.[17]

A recurring problem in this kind of exercise is deciding just
how large a deviation has to be before it indicates that the PPP
hypothesis is discredited. There is no objective method of resolving
this issue and so it becomes a matter of judgement and hence potentially
of dispute.[18] In the turbulent 1930's, as portrayed by Nurkse (1944),
a similarly extreme view (to his) might be adopted and it could be
argued that relatively large deviations - perhaps 10% or even 15% -
from PPP values might still be interpreted as encouraging for the PPP
hypothesis and somewhat larger deviations might be expected. However,
this is an extreme view. Nevertheless, the evidence relating to bi-
lateral exchange rates (presented above) did suggest an important role
for non-price variables and consequently, it may be reasonable to
ignore deviations of up to 5% and only treat those greater than 10%
as being excessive. A further complication concerns the adequacy of
1929 as a base year. Whilst it has been argued that the pound, for
example, was possibly at equilibrium in some general balance of
payments sense in 1929, this was probably not the case in terms of
relative prices, both for the pound and for several other currencies.
Thus a deviation from the 1920-based PPP may, in fact, represent a
movement towards, rather than away from, equilibrium if 1929 were
a disequilibrium year. This possibility must be remembered.

Despite these problems the results for the pound are basically
encouraging particularly for the "wide" (28 and 24 country) versions:
the wide COL-adjusted index is within 5% of a hundred for 70% of the
February, 1930 - August, 1939 period and the WP-adjusted version for
60% of the time. The "narrow" (7 country) versions tend to be rather
lower but still remain within 10% for much of the time. Moreover,
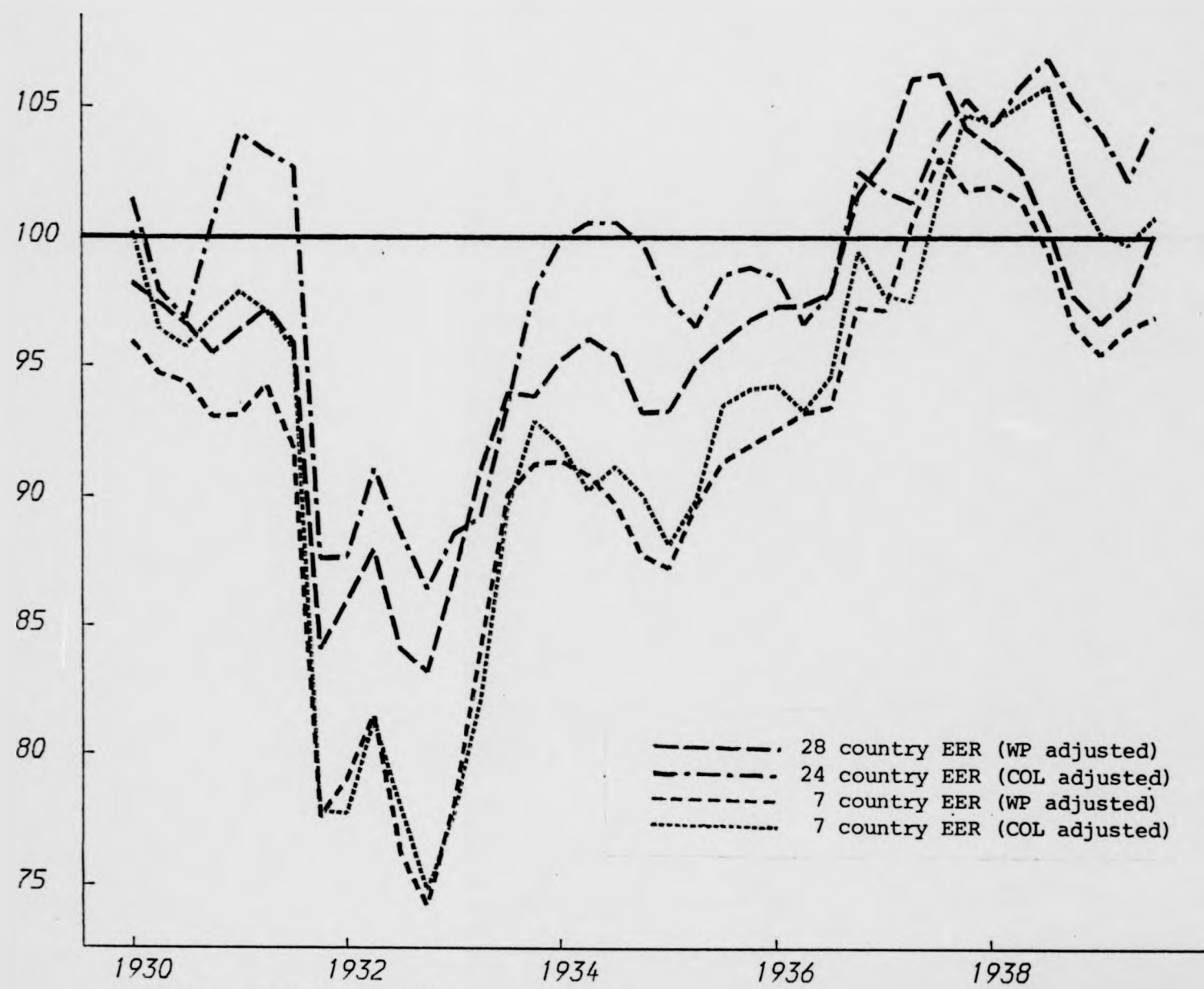
FIG. 11.1   U.K.   REAL EER's

FIG. 11.2 U.S. REAL EER's

108

106

104

102

100

98

96

94

92

90

88

86

—————— 28 country EER (WP adjusted)
—·—·—·— 24 country EER (COL adjusted)
- - - - -   7 country EER (WP adjusted)
············   7 country EER (COL adjusted)

1930   1932   1934   1936   1938
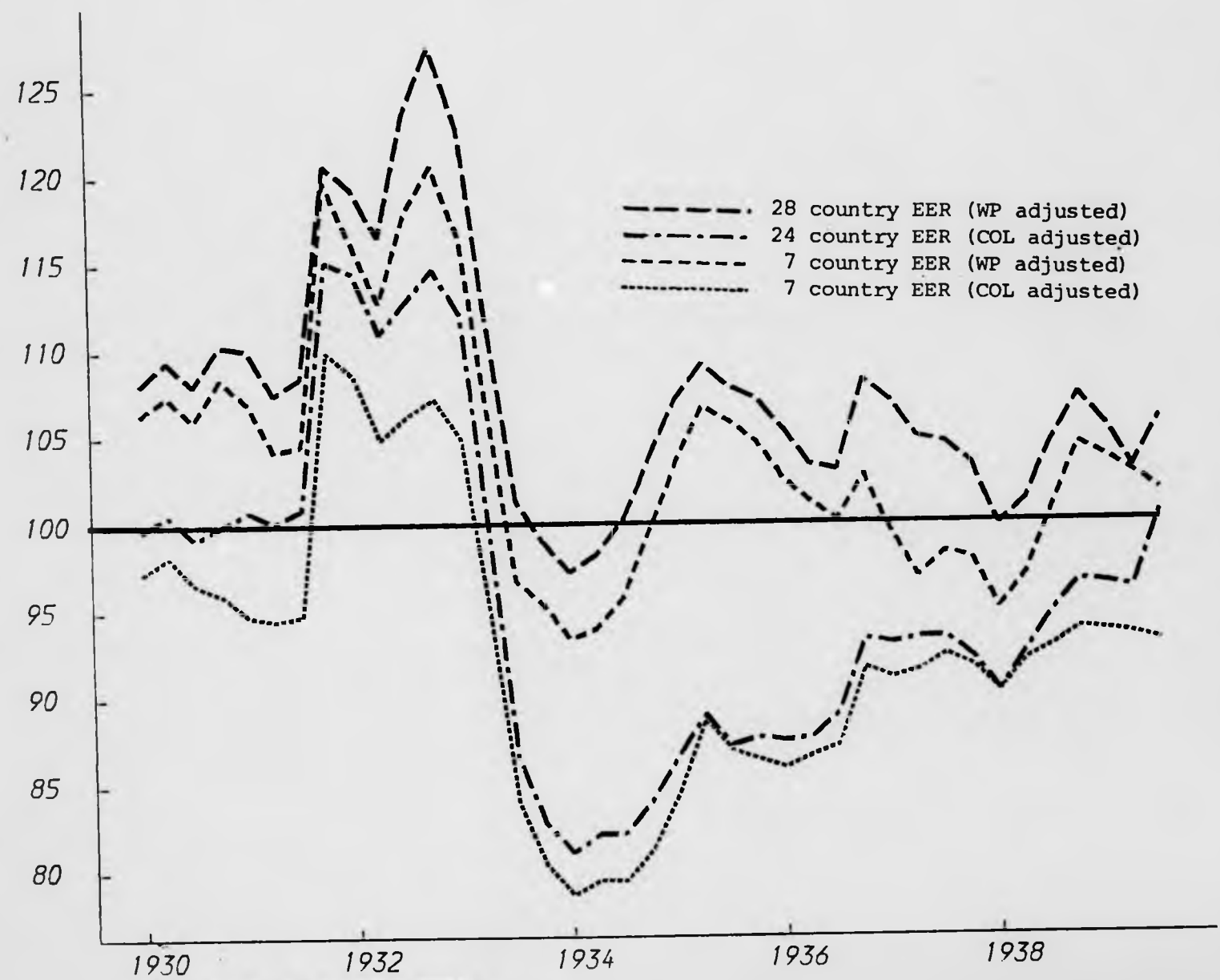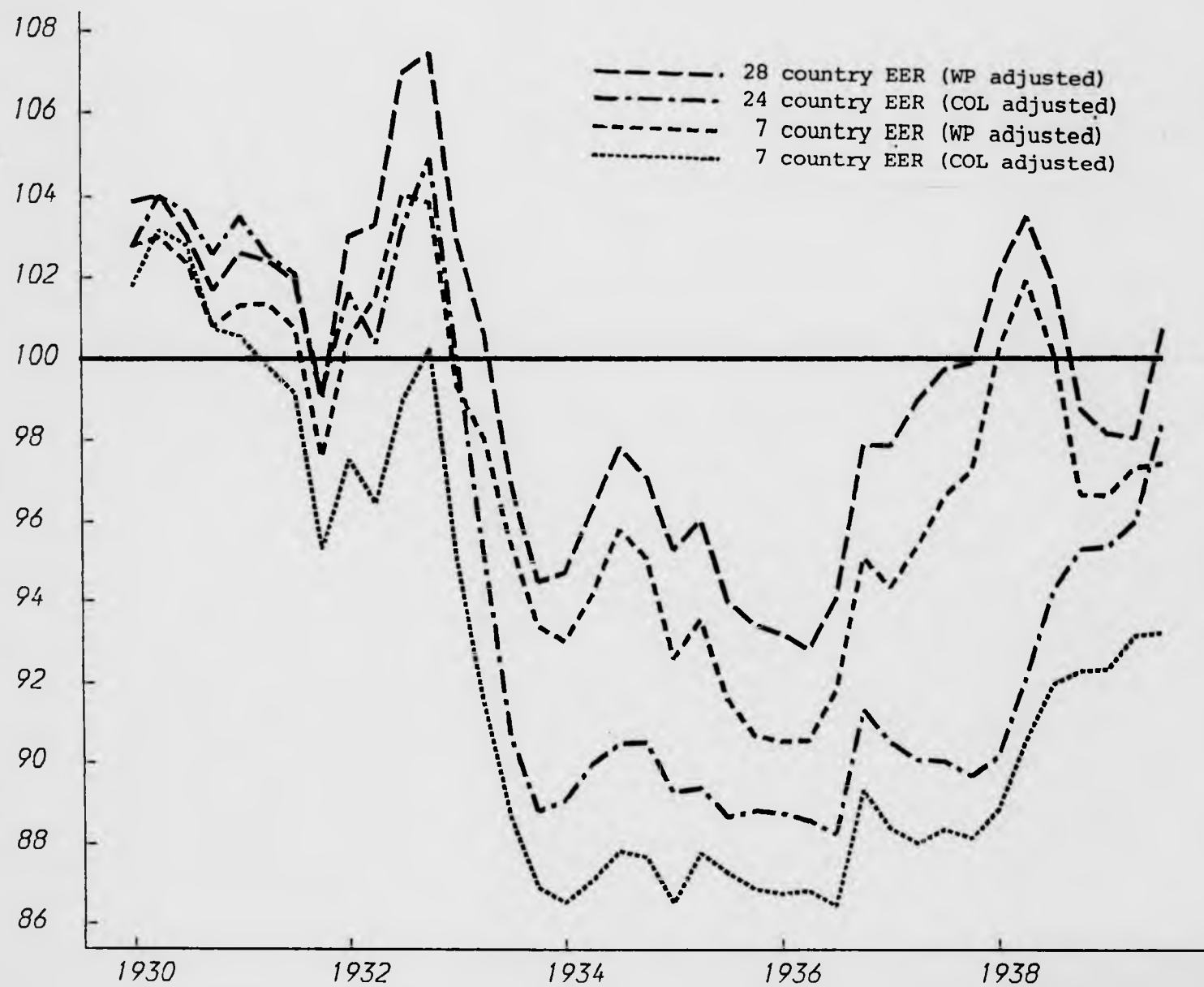
<u>11.3</u>   CANADIAN REAL EER's

FIG. 11.4   FRENCH REAL EER's

Legend:
- 28 country EER (WP adjusted)
- 24 country EER (COL adjusted)
- 7 country EER (WP adjusted)
- 7 country EER (COL adjusted)

135 —

130 —

125 —

120 —

115 —

110 —

105 —

100 —

95 —

90 —

——————. 28 country EER (WP adjusted)
—·—·—·—. 24 country EER (COL adjusted)
—————— 7 country EER (WP adjusted)
················ 7 country EER (COL adjusted)

1930   1932   1934   1936   1938
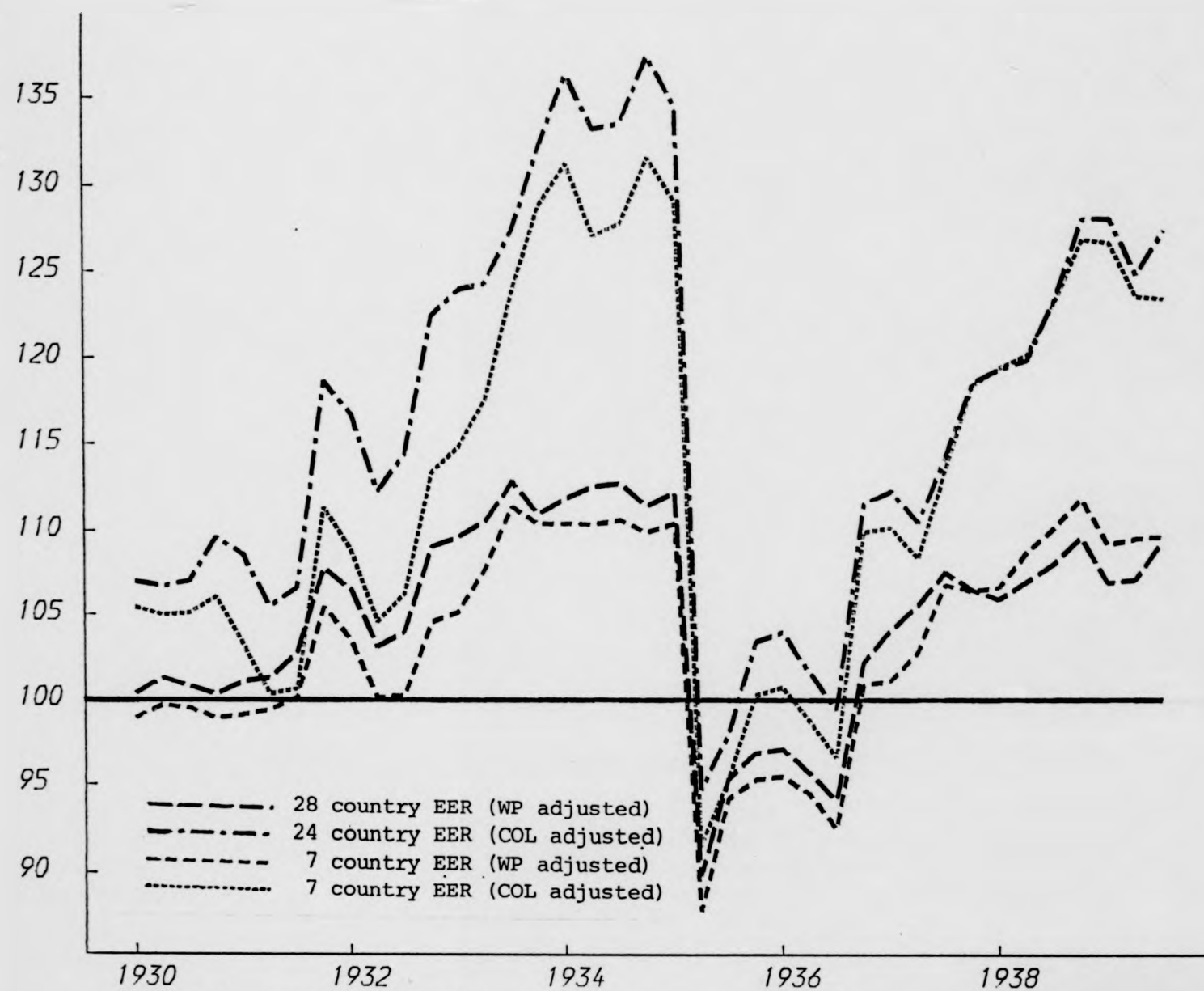
FIG. 11.5   BELGIAN REAL EER's
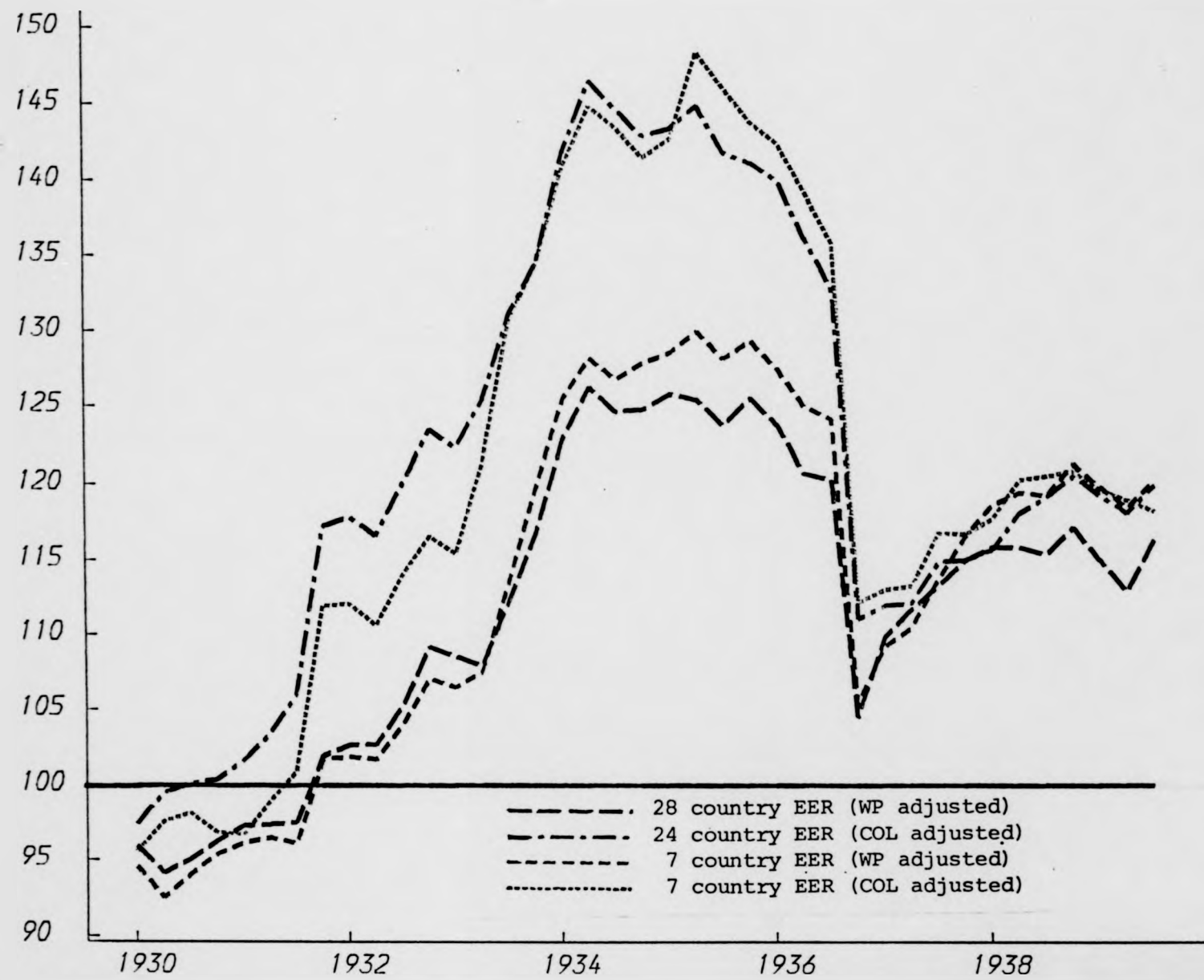
FIG. 11.6   DUTCH REAL EER's
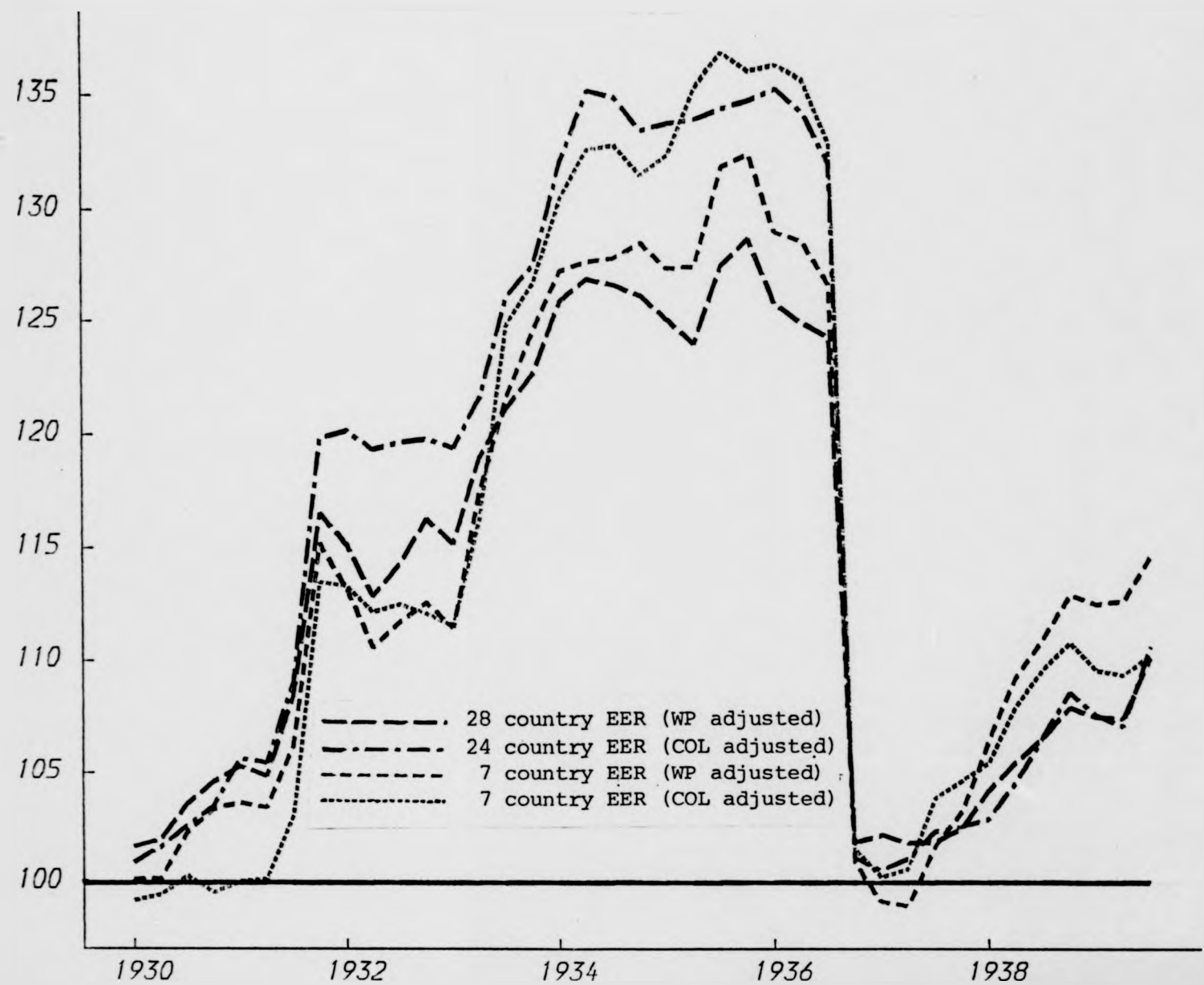
FIG. 11.7   SWISS REAL EER's

in spite of the differences in levels, the trend of all four real
EER's is virtually identical:[19] the pound became undervalued in
autumn, 1931 and remained so until late 1936 but for the rest of
the period was approximately at an equilibrium level. It is not
difficult to explain this undervaluation. The most obvious explanation
lies in the activities of the EEA which is widely believed to have
been deliberately holding the pound down in this period; this
possibility has already been extensively discussed earlier in the
study. Secondly, the fact that a recovery was beginning to take place
in Britain at this time, whilst many other countries (notably those in
the gold bloc) were still in a state of depression, may provide an
additional explanation in terms of relative income effects. Finally,
if the pound were indeed overvalued in 1929 and that year is an
unsuitable base, then at least part of this "undervaluation" is
apparent rather than real.

It may also be possible to explain some specific sub-periods
by reference to the speculative dummies (or to periods characterised
in the bilateral exchange rate regressions by large residuals). The
extent of the undervaluation at the turn of 1931 and its decrease in
spring, 1932 clearly falls into this category; this period is covered
by K1, a highly significant British speculative dummy (in the bilateral
regressions), associated with sterling weakness due to various specu-
lative factors.[20] Similarly, a slight tendency towards more under-
valuation in early 1935, which occurs in the two COL adjusted indices,
may be associated with the influences represented by $K4$[21] and the
decrease in the degree of undervaluation in early 1933 of all four
indices is quite clearly related to K2. This does not account for
all the deviations of the pound from its PPP value - in particular

there is no obvious reason for the real effective pound to be at
its lowest level in late 1932 - but it is highly suggestive: much
of the effective pound's deviation from its PPP level can be
adequately explained. Finally, it is interesting to note that the
conclusion reached on the basis of the pound's nominal EER - that the
EEA deliberately depressed the pound in the 1930's - is supported by
the movements of the pound's real EER.

Unlike the pound's real EER's, there are significant differences
between the WP and COL adjusted indices for the dollar, particularly
in the wide version. The conclusions that should be drawn from the
COL versions are quite clear: for the period between the pound leaving
gold in 1931 and the beginning of the dollar depreciation in 1933 the
dollar was overvalued, possibly by as much as 15%;[22] from the spring
of 1933, however, the dollar became undervalued until the end of the
decade, particularly in 1933-34 and by more than 10% until late 1936.
The implications of the WP versions are equally clear: the dollar was
overvalued for most of the decade, excessively so in the late 1931 to
early 1933 period, with the exception of 1933-34 and possibly early
1938.

Expectations (and probably the truth) lie somewhere between these
two views and a compromise based on both indices would suggest a middle
position consisting of three main propositions. Firstly, the dollar
became overvalued in the October, 1931 - March, 1933 period (possibly
reflecting the undervalued pound) reaching two peaks: the first of
these at the turn of 1931 coincides with K1 and clearly, therefore,
does reflect the undervalued pound and the other, at the turn of 1932,
coincides with a U.S. speculative dummy (S3), significant in the bi-
lateral regressions and associated with dollar strength.[23] The

second proposition is that the dollar was undervalued in 1933-34; this was expected and the fact that it is true multilaterally as well as bilaterally (as strongly suggested by the significance of S4 and S5 in the bilateral regressions) is no surprise.

Thirdly, from 1935 onwards the position of the dollar is not clear: the WP version indicates that it became slightly overvalued but remained fairly close to its PPP level but the COL version showed a persistent undervaluation which, for 1935, is more consistent with the bilateral results (bearing in mind the significance and signs of S6 in the latter). A common feature of all four of the American indices in this final sub-period is the increase in the extent of the undervaluation in early 1938. This could have been caused either by the 1937/38 recession and consequent relative income effects or by the influences associated with S9, an American speculative dummy which was significant in the bilateral regressions and covers this period. In general, the course of the real EER of the dollar gives less support for the PPP hypothesis than that of the pound but, nevertheless, deviations did tend to occur where expected and after 1935 the WP version does seem to indicate that PPP held approximately.

The Canadian real EER's are rather similar to those of the U.S. in that the COL adjusted versions are appreciably lower but dissimilar in that there is no important conflict between the latter and the WP adjusted indices. The WP indices would, in fact, suggest that PPP held quite well for the Canadian dollar in the 1930's, remaining within 5% of its PPP value for three-quarters of the time[24] and always within 10%. The COL versions are less encouraging: although they concur with the apparent equilibrium in the first three years or so, from mid-1933 onwards they indicate undervaluation (of up to 14%)

until the end of the 1930's. However, this does not actually
contradict the WP adjusted EER's because they too indicate an under-
valuation for much of this period, particularly during 1933-36. Indeed,
fairly obvious explanations for this tendency to be undervalued after
mid-1933 (and especially until late 1936) are available in the shape
of the apparent overvaluation of the gold bloc countries for much of
this period (discussed below) and also the fact that the Canadian
dollar may have moved in sympathy with the undervalued U.S. dollar.
(Two Canadian speculative dummies, DC5 and DC7 specifically included
to represent this latter possibility were significant in the bilateral
regressions).

It is also possible (as with the pound and the dollar) to look
to dummy variables and large residuals in the bilateral regressions to
explain specific sub-periods: the increase in overvaluation at the turn
of 1932 coincides with a Canadian dummy (DC3) which was significant
and associated with Canadian dollar strength in the bilateral re-
gressions (although admittedly "wrongly" signed); the increase in
the degree of undervaluation at the turn of 1933 also corresponds to
a significant Canadian dummy (DC5); finally, the tendency towards
greater undervaluation for much of 1936 can be associated with a
combination of speculative effects (DC7, January-February), positive
residuals in the Canadian dollar-pound estimates (March-April) and in
the Canadian dollar-U.S. dollar estimates (July-October).[25]

Moreover, on the basis of a priori expectations, the role of
relative incomes might also be expected to be important in the Canadian
case although it is difficult to pick out specific examples of this.
Indeed, it was anticipated that, for a number of reasons (including
the high level of Canadian protection), relative price effects would

be weak and in the Canadian dollar-pound regressions this did turn
out to be the case. Consequently, the lack of extreme deviations
from PPP (particularly in the WP adjusted case) could be construed
as indicative of a rather greater role for relative prices than
might have been expected.

The gold bloc currencies all show a tendency towards over-
valuation in the 1930's. This is particularly true of France with
the COL adjusted version suggesting that a peak of 70% overvaluation
was reached in 1934. The path of the French real EER is very clear
since, despite differences in levels, the WP and COL adjusted versions
(both wide and narrow) exhibit the same trend: the franc gradually
became progressively overvalued in the early 1930's reaching a peak
in the first half of 1934, it became less overvalued for a short while
after this but the degree of overvaluation resumed its upward trend
in autumn 1935 until the September, 1936 devaluation, after which,
the degree of overvaluation was reduced (and in fact almost dis-
appeared in the WP version); howevever, the upward movement still
continued until the trend reversed itself and the overvaluation
eventually became an undervaluation.

This tendency towards persistent (and large) overvaluation and
the short period of undervaluation in the late 1930's (with very little
equilibrium in between) clearly indicates that a simple PPP approach
is inappropriate in the case of the French franc. Nevertheless, it
is possible to argue that, after allowing for a number of fairly
obvious explanations of this undervaluation, the remaining deviation
from PPP would be much less pronounced, especially in the WP version.
These explanations include the apparent undervaluations of the pound
and the dollar in much of the 1930's (due, in part to the influence

of the EEA in the former case), the continued recession in France
leading to a lower level of demand for foreign goods and currency
(a relative income effect) and also the fact that 1929 may be an in-
appropriate base year for the franc in that it was widely believed
that it had returned to gold at an undervalued level in 1928; hence
much of the franc's apparent overvaluation in the 1930's may actually
represent a movement towards PPP equilibrium.

In addition to these general arguments, some of the changes
in the degree of overvaluation in specific sub-periods can be explained
by speculative influences as represented by the French dummy variables
and the residuals in bilateral regressions. The peaking of French
overvaluation in early 1934 coincides with residuals in both the
pound-franc and dollar-franc estimates (for January-February, 1934)[26]
which indicated franc strength and were tentatively attributed to
official intervention. Subsequently, although all the real EER's
drop back immediately after this, they still remain at their highest
levels in the 1930's and this, in part, could well be due to speculative
influences causing the franc to appreciate in 1934 and represented by F3.

Obviously speculative influences cannot explain all the deviations
and dummies which were significant in the bilateral regressions do not
always find their counterpart in the paths of multilateral exchange
rates (as will be made even clearer by the regression results presented
in the next section). Nevertheless, it does seem that some of the
movement of real EER's in general, and that the French franc in
particular, can be attributed to the influences represented by the
speculative dummies. In the latter case, it is also possible to
suggest that the apparent overvaluation of the franc for much of the
1930's can be accounted for and that an underlying relative price

influence still exists, even though it is not dominant.

The Belgian real EER also tends to be overvalued for much of the 1930's although to a much lesser degree than that of France. Another similarity is that the COL-adjusted version is consistently higher. Furthermore, each of the four EER's indicates the same pattern: the belga gradually became increasingly overvalued until its devaluation in March, 1935, after which it became undervalued until the French franc devaluation in Autumn, 1936, when the over-valuation resumed. In accounting for this, all the explanations used for the pre-devaluation overvaluation of the French franc - initial under-valuation in 1929, British and American undervaluations and relative income effects - can also be used in the Belgian case, whilst the middle period of belga undervaluation may well support the contention (expressed in Chapter 6) that the belga was undervalued against the franc for the April, 1935 - September, 1936 period; indeed this may be extended to other currencies of the gold bloc (and, effectively, amounts to saying that they were all overvalued).

Similarly, the return to an overvalued position in the latter part of the decade may also reflect French franc disequilibrium (in this case, undervaluation). Finally, despite the fairly good showing of the Belgian speculative dummies in the bilateral regressions, there is no obvious period during which the real EER was influenced by the speculative factors which they represent. In conclusion, it is perhaps worth noting that, in spite of the general tendency towards overvaluation the WP adjusted EER's suggest that the belga was rarely more than 10% above or below its PPP level.

The Dutch real EER indicates overvaluation for most of the 1930's

although it was approximately at equilibrium until Britain left
gold in 1931 and for a brief period immediately after the Dutch
followed in 1936. It should be remembered, of course, that a
combination of protection and extreme gold standard orthodoxy was
expected to undermine relative price effects in Holland and this did
indeed turn out to be the case for the guilder-pound exchange rate.
Consequently, a close correspondence of the Dutch EER to its PPP
value would have been rather surprising. The Swiss franc is notable
in that all four versions of the real EER are not only in agreement
in terms of trends, but also levels. The Swiss franc, like the guilder
became increasingly overvalued as the 1930's progressed, although the
devaluations in autumn, 1936 seems to have restored equilibrium at
least until mid-1938.

To a great extent the reasons suggested for the French and
Belgian overvaluations in the first half of the decade clearly apply
to all the gold bloc currencies, including the guilder and the Swiss
franc; moreover, the overvaluation in the late 1930's could be attributed
to the French undervaluation at that time. Specific reference to Dutch
and Swiss speculative dummies, however, is not useful (as in the Belgian
case) but, since they were of limited importance in the bilateral re-
gressions, their inability to "explain" movements in the (real) multi-
lateral EER is unsurprising. In general, it must be conceded that,
in PPP terms, the gold bloc currencies were certainly overvalued to
some extent in the 1930's (although the real EER's presented here may
overstate it for the reasons outlined above). Nevertheless, this does
not preclude a role for relative prices in effective exchange rate
determination in the 1930's but, rather, it could be interpreted as
indicating that relative prices were not the only determinant and other

variables were important; indeed, the results of the regressions involving bilateral exchange rates would support this view.

Consequently, a simple test of the "pure" PPP hypothesis was unlikely to be successful. However, it has been indicated that relative prices have some role and more precise (statistical) support for this contention is provided by Table 11.3 which compares the standard deviations

TABLE 11.3: STANDARD DEVIATIONS OF NOMINAL AND REAL EERS

	U.K.	U.S.	Canada	France	Belgium	Holland	Switzerland
29C: Nominal	6.42	12.15	4.60	25.71	14.30	15.91	15.46
29C: Real (WP)	5.76	7.07	3.86	12.05	5.80	10.10	9.63
29C: Real (COL)	5.71	9.67	5.89	24.92	11.63	14.72	13.21
7C: Nominal	9.29	10.75	4.09	29.06	13.91	17.53	15.19
7C: Real (WP)	7.38	7.08	4.02	12.42	6.20	12.09	10.85
7C: Real (COL)	8.41	8.15	5.55	25.23	11.41	16.17	13.44

Key: 29C = 29 country model
     7C = 7 country model
     (WP) = WP adjusted
     (COL) = COL adjusted

of nominal and real EERS. If relative prices influence exchange rates then real EER's should be less variable   and hence have smaller standard deviations). This is clearly the case for all countries, whether 29 or 7 country EER's are used, with the exception of the COL-adjusted Canadian real EER, although even here the increase in variation of the real EER is relatively small.

In many ways these simple tests, involving calculating real EER's, indicate more about the role of non-price variables in multilateral

exchange rate determination than relative price effects. It is
likely that relative prices had some effect (since realEER's are less
variable than nominal EER's and also some countries' real EER's do
stay quite close to their PPP equilibrium levels for sustained periods)
but it is equally obvious that PPP did not hold even approximately
for much of the time and other variables were important; in particular,
the occasions on which official intervention (especially that of the
EEA), relative income levels and speculative factors (as represented
by the speculative dummies) probably had some effect have been illustrated.
More generally, expectations about deviations from PPP were usually
realised: the pound did become undervalued because of the EEA's
activities, the dollar was deliberately undervalued in 1933-34 and
the gold bloc currencies did become increasingly overvalued (until
they were devalued in 1936).

However, the highlighting of the importance of non-price variables
does point to the general unsatisfactory nature of these tests and the
exclusion of such variables constitutes a major aspect of this. The
extent to which the base year represented equilibrium (in simple PPP
terms) might also be questioned and the lack of reliability of some
of the price data used in the wide version of the real EER criticised.[27]
More fundamentally, the inclusion of countries which practiced wide-
spread exchange controls (such as Germany) and, indeed, were excluded
from the examination of bilateral exchange rates for precisely this
reason, must surely reduce the likelihood of the EER following its
PPP path. Fortunately, these two latter problems are minimised by
also calculating a 7 country version of the real EER but this still
does not adequately deal with the exclusion of non-price variables.
Consequently, in an attempt to remedy this, a second series of tests

was undertaken involving regression analysis, thereby allowing
such variables to be incorporated. This exercise is described in
the next section.

(III)

An initial problem of the regression analysis was to decide
which of the variables used in the bilateral regressions could be
"converted" into multilateral versions. Clearly multilateral price
variables are available because they have already been calculated and
it is not difficult to extend this calculation to income (although
there are problems with data availability, discussed below). In
addition, seasonal and trend variables can be easily incorporated
along with the speculative dummies of the country whose EER is being
examined. However, it is not really possible to construct acceptable
"ROW speculative dummies" or a "ROW interest rate", since these variables
are already proxies and to extend them further would be an extremely
tenuous exercise. This latter argument also applies to official
intervention and there are, in addition, less obvious reasons why an
appropriate variable to represent this cannot be included. The inter-
vention dummies used in the bilateral regressions reflect intervention
to influence bilateral exchange rates not the activities of individual
exchange funds and the construction of a multilateral ID for an
individual currency would be difficult for two major reasons: firstly,
subjective judgement would be required to decide whether, for example,
British intervention to support the pound against the dollar merited
the same weight as intervention to support the pound against the
minor gold bloc currencies; secondly, to the extent that different
exchange funds operated on each other's behalf, then incorporating

all a given country's intervention would not capture all inter-
vention aimed at influencing its exchange rate anyway.[28]

Having decided on which variables to include in the multilateral
regressions, a further problem relates to the selection of the countries
to be included in the calculation of multilateral variables. Obviously,
any country which did not have a relatively "free" exchange rate should
be excluded as the model of exchange rate determination developed here
would not apply to such countries. (This was a problem in the PPP
tests using the 29 country model in the previous section). Moreover,
a balance has to be struck between the availability and reliability
of data, on the one hand, and maximising country coverage, on the other.
A high country coverage is desirable but there is no income data and it
is difficult to find suitable proxies for some countries. Consequently,
it was decided to include only the countries whose exchange rates had
been examined bilaterally thereby producing a 7 country model.[29] This
is a relatively small number but, nevertheless, it does include the
three most important countries - the U.K., U.S. and France[30]_
certainly in terms of the size of weights in the 29 country EER's.[31]

In the first instance, then, OLSQ estimates for each country's
EER were produced with relative prices, relative incomes, the country
concerned's speculative dummies, seasonal variables and a linear trend
as the independent variables. Unfortunately, with the possible exception
of the WP version of the U.S. dollar (where the Durbin-Watson statistic
was in the indeterminate range) all these estimates were serially correlated.
Consequently, although, by and large, relative price and income variables
were significant and correctly signed,the OLSQ regressions had to be
discounted and the equations were re-estimated using the Cochrane-
Orcutt (CORC) technique. It is the CORC estimates that are presented in
Tables 11.4-11.10; all variables that were not significant (at the 20% level
at least) have been excluded.

all a given country's intervention would not capture all intervention aimed at influencing its exchange rate anyway.[28]

Having decided on which variables to include in the multilateral regressions, a further problem relates to the selection of the countries to be included in the calculation of multilateral variables. Obviously, any country which did not have a relatively "free" exchange rate should be excluded as the model of exchange rate determination developed here would not apply to such countries. (This was a problem in the PPP tests using the 29 country model in the previous section). Moreover, a balance has to be struck between the availability and reliability of data, on the one hand, and maximising country coverage, on the other. A high country coverage is desirable but there is no income data and it is difficult to find suitable proxies for some countries. Consequently, it was decided to include only the countries whose exchange rates had been examined bilaterally thereby producing a 7 country model.[29] This is a relatively small number but, nevertheless, it does include the three most important countries - the U.K., U.S. and France[30] - certainly in terms of the size of weights in the 29 country EER's.[31]

In the first instance, then, OLSQ estimates for each country's EER were produced with relative prices, relative incomes, the country concerned's speculative dummies, seasonal variables and a linear trend as the independent variables. Unfortunately, with the possible exception of the WP version of the U.S. dollar (where the Durbin-Watson statistic was in the indeterminate range) all these estimates were serially correlated. Consequently, although, by and large, relative price and income variables were significant and correctly signed, the OLSQ regressions had to be discounted and the equations were re-estimated using the Cochrane-Orcutt (CORC) technique. It is the CORC estimates that are presented in Tables 11.4-11.10; all variables that were not significant (at the 20% level at least) have been excluded.

TABLE 11.4: ESTIMATES FOR THE MULTILATERAL POUND[1,2]

	EXPECTED SIGN	WP	COL
Constant	?	58.2 (3.14)	91.8 (3.66)
World prices/U.K. prices	+	3.01 (0.20)	-31.7 (1.39)
Trend	?	0.36 (5.90)	0.39 (6.91)
Seasonal variables: A1	?	-0.62 (1.34)	-0.84 (1.74)
B1	?	0.56 (1.19)	0.60 (1.31)
Speculative dummies: K1	−	-4.35 (4.06)	-4.36 (4.11)
K4	−	-2.28 (2.18)	-2.35 (2.26)
Rho		0.89 (18.5)	0.89 (18.0)
R-SQUARED		0.98	0.98
DURBIN-WATSON STATISTIC		1.55	1.49
STANDARD ERROR OF THE REGRESSION		1.39	1.37
F-STATISTIC		319.4	327.4

Notes: 1.   T-statistics in brackets

2.   Omitted (insignificant) variables: relative incomes, A2, B2, K2, K3.

TABLE 11.5:   ESTIMATES FOR THE MULTILATERAL U.S. DOLLAR[1]

	EXPECTED SIGN	WP	COL
World prices/U.S. prices	+	86.8 (9.48)	12.0 (0.38)
World income/U.S. income	+	27.1 (4.82)	20.4 (2.25)
Seasonal variables: A1	?	1.27 (2.34)	0.09 (0.14)
B1	?	-0.52 (0.92)	-1.56 (2.21)
B2	?	-1.00 (2.27)	-0.32 (0.88)
Speculative dummies: S2	–	-2.88 (1.40)	-1.66 (1.09)
S3	–	1.20 (0.71)	4.25 (2.20)
S4	–	-11.1 (7.54)	1.75 (0.73)
S5	–	-13.9 (12.0)	-4.07 (1.66)
S6	+	-3.73 (2.08)	-1.34 (0.70)
S7	+	1.47 (0.74)	2.89 (1.90)
S9	–	-2.53 (1.52)	-0.75 (0.49)
S10	+	3.05 (1.40)	1.09 (0.50)
Rho		0.33 (3.20)	0.97 (34.4)
R-SQUARED		0.97	0.98
DURBIN-WATSON STATISTIC		1.99	1.99
STANDARD ERROR OF THE REGRESSION		2.33	2.05
F-STATISTIC		134.5	173.1

Notes: 1.   Omitted (insignificant) variables: constant, trend,
          A2, S1, S8.

TABLE 11.6: ESTIMATES FOR THE MULTILATERAL CANADIAN DOLLAR[1]

	EXPECTED SIGN	WP	COL
Constant	?	76.7 (4.21)	90.8 (3.73)
Trend	?	0.16 (1.21)	0.20 (1.36)
Seasonal variables: A1	?	0.78 (1.78)	0.90 (2.08)
A2	?	0.37 (1.89)	0.34 (1.71)
Speculative dummies: DC8	+	1.87 (2.15)	1.85 (2.13)
Rho		0.96 (34.1)	0.97 (34.8)
R-SQUARED		0.92	0.92
DURBIN-WATSON STATISTIC		1.92	1.90
STANDARD ERROR OF THE REGRESSION		1.16	1.16
F-STATISTIC		49.1	49.0

Notes: 1. Omitted (insignificant) variables: relative prices, relative incomes, B1, B2, DC1, DC2, DC3, DC4, DC5, DC6, DC7, DC9, DC10.

TABLE 11.7: ESTIMATES FOR THE MULTILATERAL FRENCH FRANC[1]

	EXPECTED SIGN	WP	COL
Constant	?	196.4 (4.20)	21.4 (0.39)
World prices/French prices	+	26.7 (1.70)	179.6 (4.29)
Trend	?	-1.76 (3.83)	-0.95 (2.43)
Seasonal variables: A1	?	0.06 (0.06)	-2.52 (2.30)
Speculative dummies: F4	−	4.63 (1.62)	5.56 (2.15)
F8	−	8.51 (2.96)	8.13 (3.08)
F9	−	-18.0 (4.95)	-17.5 (5.30)
F10	−	-10.0 (2.61)	-8.85 (2.53)
F12	−	-9.39 (3.24)	-8.78 (3.30)
Rho		0.97 (37.7)	0.97 (34.5)
R-SQUARED		0.99	0.99
DURBIN-WATSON STATISTIC		2.15	2.14
STANDARD ERROR OF THE REGRESSION		3.01	2.76
F-STATISTIC		396.7	473.2

Notes: 1. Omitted (insignificant) variables: relative incomes, A2, B1, B2, F1, F2, F3, F5, F6, F7, F11.

TABLE 11.8: ESTIMATES FOR THE MULTILATERAL BELGA[1]

	EXPECTED SIGN	WP	COL
Constant	?	90.4 (1.74)	91.5 (1.55)
Speculative dummies: BG3	–	12.4 (4.72)	12.6 (4.66)
BG4	–	24.9 (9.66)	25.0 (9.39)
BG6	–	5.60 (2.47)	5.60 (2.47)
Rho		0.97 (39.8)	0.98 (41.4)
R-SQUARED		0.96	0.96
DURBIN-WATSON STATISTIC		1.97	1.89
STANDARD ERROR OF THE REGRESSION		3.02	3.04
F-STATISTIC		94.6	94.0

Notes: 1. Omitted (insignificant) variables: relative prices, relative income, trend, A1, A2, B1, BG1, BG2, BG5, BG7, BG8, BG9.

TABLE 11.9: ESTIMATES FOR THE MULTILATERAL GUILDER[1]

	EXPECTED SIGN	WP	COL
Constant	?	187.0 (4.44)	166.5 (2.37)
Rho		0.96 (30.6)	0.95 (28.7)
R-SQUARED		0.95	0.95
DURBIN-WATSON STATISTIC		1.73	1.87
STANDARD ERROR OF THE REGRESSION		3.18	3.21
F-STATISTIC		88.4	86.7

Notes: 1. Omitted (insignificant) variables: relative prices, relative incomes, trend, A1, A2, B1, B2, H2, H3, H4, H5, H6, H7, H8.

TABLE 11.10:   ESTIMATES FOR THE MULTILATERAL SWISS FRANC[1]

	EXPECTED SIGN	WP	COL
Constant	?	69.6 (1.32)	239.1 (2.68)
World prices/Swiss prices	+	94.2 (2.34)	-93.2 (1.16)
Seasonal variables: B2	?	1.05 (1.51)	1.05 (1.46)
Rho		0.96 (29.9)	0.96 (30.9)
R-SQUARED		0.94	0.94
DURBIN-WATSON STATISTIC		1.89	1.70
STANDARD ERROR OF THE REGRESSION		3.60	3.70
F-STATISTIC		62.1	58.4

Notes: 1.   Omitted (insignificant) variables: relative incomes, trend, A1, A2, B1, SW1, SW2, SW3, SW4, SW5, SW6, SW7, SW8, SW9, SW10.

It is clear that the regression results are rather poor and, in some cases, the EER seems to have been principally determined by some combination of the constant term, the trend variable, speculative effects (as represented by the dummy variables) and seasonal factors. On the other hand, relative price effects are apparent in three cases (the U.S., France and Switzerland) and in two others - Canada and Holland - were expected to be weak anyway. Moreover, if it is accepted that the model is less applicable to the minor gold bloc currencies (since their exchange rates were heavily influenced by the pound-dollar-franc triangle) then the only major surprise is the failure of any correctly signed relative price effects to show up in the case of the pound. The "wrong" sign in the COL version is particularly puzzling since the pound was only once associated with perverse bilateral price effects (in its

relationship with the guilder). However, these problems may well
be due to the exclusion of any variable to represent the activities
of the EEA which probably "distorted" the path of the pound's EER and,
on occasion, pushed it in the opposite direction to that indicated by
"economic fundamentals". (In any case the "wrongly" signed COL ratio
is only significant at the 20% level).

Nevertheless, to the extent that it was usually relative prices
based on WP's, not COL indices, that were important - on two out of
the three occasions when the relative price variable was significant,
in fact - and relative income was only significant in one case (the
U.S. dollar), the results could be construed as being supportive of
the Nurkse hypothesis, at least in the negative sense of not supporting
the alternative hypothesis put forward here. However, the speculative
dummies do not perform especially well either (and where they do it is
usually in the regressions in which relative prices actually are
significant) and so the regression results might be interpreted as
providing strong support for neither hypothesis. This view is supported
by the fact that the generally poor performance of the relative income
variables can probably be explained in terms of data inadequacies.
Indeed, this variable performed only tolerably well in the bilateral
regressions since, though usually significant, it was "wrongly" signed
for a third of the time; consequently, this could be expected to lead
to a cancelling out effect in the multilateral relative income variable.

Despite the generally poor quality of the results, it might be
useful to consider the variables that are significant to see if they
perform as expected and also whether their performance is consistent
with that in the bilateral regressions. In the case of the pound the
trend variable indicates a gradual appreciation (as indeed it did in

the bilateral regressions) and the "traditional" seasonal pattern
of autumnal weakness and spring strength was very much apparent in
the shape of the significance and sign of A1. The importance of B1
is less certain but, in any case, taken in conjunction with A1 it
modifies the seasonal pattern rather than changes it. Two speculative
dummies are significant: K1's appearance was expected but that of K4
is surprising as it was never significant in any bilateral regressions,
although it is correctly signed. K2 and K3 might have been expected
to show up, given their performance in the bilateral regressions, and
their lack of significance rather supports the contention (made earlier)
that the speculative dummies did not perform especially well.

The model seems to work tolerably well for the U.S. dollar and
the estimates for U.S. EER are probably the "best" of the seven, in
terms of supporting the hypotheses embodied in the model. The signifi-
cance and correct signs of the relative price and income variables have
already been referred to and it is clear from Table 11.5 that the
speculative dummies' performance is almost entirely consistent with
a priori expectations and the results of the bilateral regressions:
where variables were "wrongly" signed in the latter (S3 and S6), they
were "wrongly" signed here, where they were insignificant, they are
also insignificant here (S1) - the exception is S8, which was significant
in most of the bilateral regressions - and the performance of the
variables tends even to match up in terms of degree of significance,
in that those which were only significant in some of the bilateral
regressions are significant at at low levels or in only one version
of the multilateral regressions (S2 and S7, for example). Finally,
the sign of the trend variable is the same as in the bilateral regressions
and, since no clear seasonal pattern emerged in the latter, the slight

difference in seasonal variations indicated in the WP and COL
versions is not surprising. In fact, the former version displays
a seasonal pattern for the dollar exactly in keeping with expectations,
that is strong in the autumn, weak in the spring; the pattern in the
COL version is similar, but from the point of view of expectations,
mistimed since it suggests that the dollar remained weak until as
late as October and then became strong until April.

Whilst the model performs rather less well for the Canadian
dollar, the actual results produce few surprises. Doubts were
expressed (in Chapter 7) about the likelihood of relative price and
income effects showing up in the Canadian case (due to trade controls)
and, to some extent, these were borne out in the bilateral regressions.
In addition, the uncertain performance of the trend variable here - it
is only significant in one version at the 20% level - is not unexpected
as it carried opposite signs in the bilateral regressions against the
pound and the U.S. dollar. Also the expectation that the Canadian
dollar would be influenced by seasonal factors - particularly because
of the importance of wheat exports to the economy - is strongly
confirmed. Only the speculative dummies perform unexpectedly as
they are mainly insignificant and the only exception (DC8) was in-
significant in the bilateral regressions. However, it is correctly
signed here and the examination of the bilateral Canadian dollar
residuals indicated that its insignificance was due to mistiming.

The French franc regressions are, on balance, encouraging. A
clear relative price effect emerges and the insignificance of the
relative income variable is not unsurprising given the difficulties
encountered with this variable in the bilateral regressions.[32] The
tendency for the franc to weaken over time, as indicated by the trend

in the bilateral regressions, is confirmed here and the limited (COL version only) evidence of a seasonal effect is consistent with the hypothesis that European currencies weakened in the autumn and strengthened in the spring (although no particular seasonal pattern had been apparent in French bilateral exchange rates).

The performance of the speculative dummies is a little erratic: the insignificance of F1 and F2 is expected, as they had been insignificant in the bilateral regressions, but since all the other dummies were significant (to varying degrees) in the latter, the insignificance of some of these others in the multilateral regressions is surprising. This is particularly true of F3 and F5 but less so of F6, F7 and F11 since their sign varied across the different bilateral exchange rates and a cancelling out effect may have occurred. Of the variables that did show up here, F8 and F12 were mainly significant in the bilateral regressions (and F8 is consistently "wrongly" signed) although this was only true of F4 in the belga-franc estimates. F9 and F10 are most interesting: they were mostly significant but usually "wrongly" signed in the bilateral regressions but are correctly signed in Table 11.7 suggesting that multilaterally the franc was indeed weak in the October, 1936 - February, 1937 period.

With the partial exception of Switzerland (for which the WP ratio is significant) the results for the rest of the gold bloc EER's are rather poor, although not actually inconsistent with the bilateral results. Indeed, only the constant term is significant in the Dutch regressions. However, it should be recalled that both speculative and "economic fundamental" variables tended to fare relatively badly in the Dutch bilateral regressions, particularly in the guilder-pound estimates. This raised some questions about the applicability of the

model to the guilder and the multilateral guilder regressions would
seem to do much the same.

The Swiss regressions, as already indicated, are the "best"
of the three: not only is one of the relative price variables
significant, but the only other significant variable (B2) indicates
the expected seasonal strength in the Swiss franc in the early part
of the year at the height of the winter tourist season. Moreover, the
failure of potential speculative influences to show up is not unexpected,
as Switzerland is a small country, although the insignificance of the
trend variable is perhaps surprising in view of the bilateral regression
results. This latter point can also be made in connection with the
other two minor gold bloc currencies.[33] In fact, in the case of
the belga, the only significant variables are the constant term and
the three speculative dummies which are all "wrongly" signed. BG3
and BG4 were similarly signed in the bilateral regressions but BG6
had been insignificant (except in earlier regressions of the belga-
dollar) and its presence in Table 11.8 is rather surprising. The
overall impression from the regressions involving the minor gold bloc
currencies is that there is little evidence that their multilateral
exchange rates were determined by either the "economic" or the
"speculative" variables included in the model.

On balance the poor quality of the results is perhaps not
surprising. Clearly there are problems in calculating the multi-
lateral variables and questions might be raised about the adequacy
of their construction. In addition, there are a number of omitted
influences including official intervention, interest rate differentials,
ROW speculative effects and also, as in the bilateral regressions, the
effects of protection. Consequently, whilst these regression results

cannot be said to indicate general support for the hypothesis that multilateral exchange rates were determined by "economic fundamentals", it is too harsh an interpretation to suggest that they show that they were not. Moreover, in at least one case (the French franc), there is firm evidence that relative prices were an important determinant of the multilateral exchange rate and more limited evidence to suggest the same for the U.S. dollar and the Swiss franc. Indeed, of the three major currencies of the 1930's, only the multilateral pound shows no signs of being determined by the "economic fundamentals" that were included in the regressions.

(IV)

In general, testing the hypotheses developed in chapter four for EER's has not been very successful in terms of providing support for these hypotheses; the results have tended to be ambiguous and difficult to interpret. To a large extent, this may be due to the crudity and inadequacies of the tests actually performed (although some of these are probably unavoidable). For example, the calculation of real EER's is essentially an examination of a simple PPP hypothesis which effectively tests directly for the importance of only one "economic fundamental". It was also subject to the criticism that too many countries which did not have exchange rate regimes that even approximated the "free" exchange rate system, to which the model is applicable, were included. Furthermore, whilst the second test, using regression analysis, incorporated more variables, the criticism of not including all important explanatory variables is valid here also, if to a lesser degree. The construction and country coverage of the

EER's might also be questioned. Therefore, there are a number of
good reasons for the rather inconclusive results.

However, on the positive side, further evidence to support
the contention that the explanatory variables included in the model
were important determinants of exchange rates was provided in some
cases, in particular for seasonal effects, some of the speculative
effects and indirectly (and more tenuously) for the role of official
intervention. In fact the consistency of performance of variables
that were significant in both bilateral and multilateral regressions
is a notable feature of the results. The contention that some of the
exchange rates were distorted by various factors, especially protection,
which is not the same as arguing that they were subject to destabilising
speculation, is also supported. Moreover, the conclusions concerning
"economic fundamentals" were far from wholly negative: interest rate
differentials unfortunately had to be excluded and the problems of
finding suitable income proxies appeared to continue but positive
evidence of a relative price effect was provided by the calculation
of the pound's real EER, the comparison of the standard deviations of
nominal and real EER's (Table 11.3), the French franc regressions and,
to a lesser extent, by those for the U.S. dollar and Swiss franc.

FOOTNOTES TO CHAPTER 11

1. Long run PPP tests are carried out by Officer (1980) for the periods 1938, 1963-66 and 1975 using a variety of base periods (to maximise country coverage) going back up to a hundred years (1879-88, 1905-1913, 1910 and 1913). Similar tests were carried out by Genberg (1978) and by the OPTICA Reports, as described in Thygesen (1978), for the 1960's and 1970's. It is also becoming increasingly common to calculate "real" EER's (that is, EER's adjusted to allow for inflation differentials). See Dimsdale (1981) for 1921-38 and World Financial Markets (1978, 1979) for the 1970's.

2. Thygesen (1978), p. 301 (Summary).

3. Ibid, p. 306.

4. Genberg (1978), p. 268.

5. Ibid, p. 273.

6. World Financial Markets (1978), p. 10.

7. World Financial Markets (1979), p. 11.

8. See World Financial Markets (1978), pp. 12-13, for a comparison of real EER's adjusted by different price indices.

9. The standard deviations are 5.57 (real EER) and 8.58 (nominal EER).

10. Officer (1980), p. 218.

11. Ibid, p. 226.

12. There is one other feature of Table 11.2 of interest in the shape of the (approximately) 10% overvaluation of the (effective) pound in 1938. This conflicts with Dimsdale's real EER (Table 11.1) which apparently suggests that the pound was undervalued by 10% in 1938. However, since different base periods were used this may indicate more about the choice of base period than the level of the pound. Nevertheless, given the use of 1929 as a base period in the present study, this divergence is disturbing and, if 1929 were a poor choice of base year and Officer's calculations were correct, then Dimsdale's index could be construed as suggesting that the pound was overvalued by about 20% in 1929. Of course, Officer's choice of base may be equally unreliable and, in any case, this undervaluation is in relative price terms and if allowance is made for other determinants of exchange rates then it is possible to take the view that in 1929 the pound was at equilibrium in a wider sense. (This issue was discussed at length in Chapter 2, Section IV).

13. The excluded country in the WP version was Mexico. In fact, in the U.K. case, since Mexico was not included in the original calculation (a 28 country model was used), the nominal EER used is the same as that discussed in Chapter 10. In the COL version the excluded countries were Mexico, Brazil, Japan, Russia and Spain. (The exclusion of the latter is probably no great loss since Spanish exchange rate data was unavailable during most of the Civil War period and had had to be interpolated).

14. This was done by multiplying the weights of the remaining countries by 100/(100 - combined weights in the 29 country EER of the excluded countries) to make the remaining weights sum to one hundred.

15. These were extensively discussed in Chapter 9, Section II.

16. In fact a comparison between scaled up versions of the 29 country model weights and those actually used in the 7 country model (and properly calculated) revealed that this latter problem is fairly trivial. There are, of course, differences but the only significant one was that the "properly calculated" weighting system tended to give a greater weight to Canada mainly at the expense of the U.K. (In the U.K. case it was at the expense of the U.S.)

17. It would have been possible to simply compare the nominal EER with its PPP value but use of a real EER allows the results to be presented as a single figure (and, furthermore, one which clearly shows the degree of over- or undervaluation).

18. Indeed Balassa (1964) and Yeager (1958) did dispute this point. The figure in question was ± 25% (for long run tests of PPP).

19. The trend of the (comparable) Dimsdale index (given in Table 11.1) is also similar. The main difference is that it suggests the real effective pound had not regained its 1929 value even by 1938. Nevertheless, the arguments concerning the reasons for the pound's undervaluation in the next paragraph are still applicable.

20. See Chapter 5, Section II.

21. This variable was never significant in the bilateral exchange rate regressions but it was significant in those using the multilateral pound (presented in the next section) in both WP and COL versions.

22. To some extent this must reflect the apparent undervaluation of the pound in the corresponding period.

23. It was, in fact, "wrongly" signed. This is discussed in Chapter 5, Section III.

24. The figure is slightly higher (80%) for the wide version than for the narrow version.

25. See Table 7.6, Chapter 7, Section V.

26. Chapter 5, Section IV, Table 5.9.

27. Price indices for some countries were based on one city or region; for others they were only available on a quarterly basis and the gaps had to be filled by interpolation.

28. Of course, all the problems of constructing intervention dummies discussed in the appendix to Chapter 4, are equally applicable here.

29. It would have been possible to construct an 11 country model by including the four Scandinavian countries but their combined weights (in the 29 country model) is small.

30. In fact, there are four major countries (in terms of importance in world trade) but the fourth - Germany - must obviously be excluded because of its use of trade and exchange controls.

31. The combined weights of the other six countries in the composite weights of the EER's (29 country model) of the seven countries were as follows:

U.K.	44.1%	France	45.3%	Holland	48.1%
U.S.	49.5%	Belgium	54.6%	Switzerland	47.7%
Canada	69.6%				

32. For some French exchange rates the relative income variables using the original proxy (employment), which is used in the multilateral regressions, were insignificant and an alternative proxy (production) had to be used. The relative income variables involving French "income" were then always significant, to varying degrees, although often "wrongly" signed. This may suggest that a cancelling out process has occurred in the multilateral variable.

33. However, the appreciating trend was against the pound, dollar and franc, not each other, and there may be a cancelling out process taking place in these multilateral regressions.

SECTION IV: CONCLUSIONS

CHAPTER 12

SUMMARY AND CONCLUSIONS

(I)

The purpose of the present chapter (and effectively the final
section) is to summarize the findings of the earlier chapters and
bring together the results (for both bilateral and multilateral
exchange rates) in order to draw some general conclusions relating
to the main themes of the study. A detailed analysis of the results
of the tests involving bilateral exchange rates - particularly the
technical aspects such as consistency of performance of variables
across different exchange rates - has already been provided (in
Chapter 8) and some preliminary conclusions about multilateral
exchange rates were suggested in the previous chapter. These have
now to be related to the wider issues.

The basic objective of the thesis has been to test what might
be called an "anti-Nurkse" hypothesis for the 1930's: specifically,
that exchange rates were generally "stable", determined by "economic
fundamentals" and not subject to excessive variation due to destabilising
speculation. This has involved examining various aspects of exchange
rates; for example, the concepts of stability and of speculation, the
role of expectations and the extension of the concept of multilateral
or effective exchange rates to the 1930's. It has also generated
evidence relating to a number of other issues, particularly the role
of official intervention in the 1930's, the PPP hypothesis and some
of the implications of using multilateral as opposed to bilateral
exchange rates for this period.

The study begins by examining the relevant theoretical and empirical literature with a view to identifying the major variables that determine exchange rates. On the basis of these surveys, a model of exchange rate determination was developed which could be viewed either as an extended PPP hypothesis - that is, the PPP hypothesis is accepted but it is realised that deviations from PPP can occur for non-speculative (or "economic") reasons and the relevant variables should be identified and added - or as being based on the premise that the variables that determine the balance of payments also determine the exchange rate (since in determining the flow of goods and services they implicitly determine the flow of currencies). It was also recognised that, realistically, some allowance should be made for speculative effects and that they ought to be explicitly modelled, and this was done by including dummy variables to represent anything that may have caused speculative capital flows.

This model was then tested, with varying degrees of success, for the bilateral exchange rates of seven countries whose currencies were relatively "free" in the 1930's, in terms of not being subject to extensive exchange controls. Attention was then turned towards multilateral exchange rates. These had never been calculated for the inter-war period and so, after an examination of the relevant methodology, EER's were calculated for all seven currencies. Given that they had never been calculated before, it was felt necessary to draw some general inferences from the EER's before using them to provide a more limited test (because of data deficiencies and method-ological problems) of the model for multilateral exchange rates.

(II)

The central hypothesis - that exchange rates were principally
determined by "economic fundamentals" in the 1930's - receives a fair
measure of support, although this is rather less true of the tests
involving EER's. The most important explanatory variable was relative
prices but it was noticeable (in both the bilateral and multilateral
tests) that WP's performed "better" and this confirmed, to some extent,
the suspicion that verification of this extended PPP hypothesis by an
index of mainly traded goods might be spurious. However, whilst their
performance was clearly "worse", the COL indices did show up reasonably
well in the bilateral tests; in particular, in two legs of the pound-
dollar-franc exchange rate triangle they were significant (at the 1%
level) and in the other (pound-dollar) a relative "price" variable
based on indices of wages, therefore containing even less traded
goods, was significant. Furthermore, despite the poor results when
multilateral exchange rates were examined, the inflation differential-
adjusted (real) EER's were less variable than the nominal EER's with
only one exception.

On obtaining similar results for a similar model, Hodgson (1971)
and Hudgins (1973) suggested that this indicated support for the PPP
hypothesis.[1] In a sense, this is true but in another, in taking
the significance of relative prices in isolation and ignoring the rest
of the model, it is not, since the rest of the model suggests that the
PPP hypothesis did not hold because numerous other variables obviously
did partially determine exchange rates. Moreover, the single explicit
test of the "pure" PPP hypothesis, carried out multilaterally (in
Chapter 11) when real EER's were calculated, clearly demonstrated that

in most cases "pure" PPP did not hold. However, if the PPP hypothesis
is interpreted as simply arguing that exchange rates were primarily,
but not solely, determined by relative prices then support is provided
for this version. Nevertheless, to the extent that some would interpret
the PPP hypothesis more rigidly, the results here do not really support
it but rather suggest that relative prices were one of several important
determinants of exchange rates.

Other "economic fundamentals" of importance were relative
incomes, interest rate differentials, seasonal effects and probably
the influences represented by the trend.[2] It must be conceded, how-
ever, that in the case of the first two (and most important) variables
the bulk of the positive evidence was contained in the section on
bilateral exchange rates,[3] although the multilateral tests did
confirm the importance of seasonal effects and the trend variable in
some cases. Furthermore, on the basis of the performance of the more
comprehensive version of the model in the bilateral tests, it could
be argued that some of the unexplained variation in EER's was probably
due to the (excluded) "economic fundamentals". Nevertheless, the
performance of the one variable of this group included in the multi-
lateral tests - relative income - was disappointing although it was
significant in the U.S. dollar regressions and the construction of the
variable was beset by methodological difficulties.

A final set of "economic" variables - ROW effects (only applicable
to bilateral rates) - were also generally significant. In retrospect,
it might have been advisable to test for ROW speculative effects.
Logically, ROW ("third country") speculative dummies should have been
included along with ROW "economic fundamentals". However, given the
subjective nature of such variables, then whilst it is acceptable to

use them directly (in regressions involving their country of origin),
to use them indirectly (in regressions involving exchange rates between
two other countries) is probably rather tenuous, although third country
speculative effects may have provided rational explanations for some
of the residuals.

The second major purpose of the thesis or, perhaps better,
another way of approaching the first, was to consider the Nurkse
charge that:

> "If currencies are left free to fluctuate, 'speculation'...
> ...is likely to play havoc with exchange rates...." (4)

Of course, to the extent that it has been demonstrated that "economic
fundamentals" determined exchange rates, this has already been refuted.
However, more specific and positive evidence was also provided in the
shape of the inclusion of speculative dummies and the examination of
the residuals and their explanation in terms of non-speculative
influences. The general impression of such tests was that, on
balance, exchange rates were not subject to destabilising speculation.
The issue is mainly examined in relation to bilateral exchange rates
but, since speculators operated on the basis of expectations about
bilateral not multilateral rates, then this is where the tests for
destabilising speculation should be concentrated. (5)

It is true that numerous speculative dummies were significant,
particularly those of Britain, France and the U.S.A. and, in some
cases, the exchange rate was clearly overshooting due to genuinely
destabilising speculation; for example, the contentions that de-
stabilising speculation caused excessive weakening of the pound at the
turn of 1931 and the gold and dollar "scares" affected the dollar in

1937-8 receive both bilateral and multilateral support. However,
such dummies tend to be in the minority since many variables are
either insignificant (implying no speculative effect) or are probably
picking up something else, such as official intervention, and are
consequently often "wrongly" signed. In addition, a few of the
variables are not really testing for destabilising speculation in
that the influences they represent are not of this type or, alternatively,
the speculation being modelled is not destabilising in the sense that
speculators were correct.

Of course, it can be suggested that these dummies provide
inadequate tests for destabilising speculation but it is difficult
to devise alternative and superior tests - a "speculative variable"
based on forward market data was also tried with limited success - and
the inclusion of no speculative variables and their replacement by an
examination of the residuals is inadequate in that it makes the implicit
(and demonstrably incorrect) assumption that all the residuals are
due to speculation. At least dummy variables are based on attempts
to identify and model destabilising speculation a priori.

Furthermore, some of the dummies (particularly S4 and S5) and
some of the residuals (especially those relating to the belga in 1935-6
and the French franc in 1936-7) indicated periods of under- or over-
valuation (in the sense of the exchange rate not being at the level
indicated by "economic fundamentals"). Whilst this indicates that
the influence of the latter was being undermined, it does not suggest
that this was due to destabilising speculation but rather to official
intervention. The exchange rate was not at its "extended PPP level"
because of government interference[6] but it was not "unstable" in
the Nurkse sense of the deviations being due to destabilising speculation;

indeed, speculation was being thwarted by the authorities as indicated by the frequent "wrong" signs of speculative dummies representing speculation in these periods (such as the French dummies in 1935-6). When large movements ultimately took place - for example, the deviations of the gold bloc currencies in 1935-6 - these were not due to destabilising speculation but, in a sense, quite the opposite: the pressure of "economic fundamentals" became irresistable. The actual devaluation may have been accompanied by a brief bout of speculation but it was not destabilising because the speculators were correct and it was the government that had made the mistakes.

This argument would imply that official intervention played an important role in the 1930's and testing specifically for the presence of intervention was one of the main secondary objectives of the study. Evidence of the importance of the exchange funds' activities had been provided by Hudgins (1973) and Ozmun (1976) who were specifically concerned with this issue. The results presented here would seem to bear their conclusions out. No tests were carried out for EER's although it was suggested that the path of the pound's real EER did indicate the presence of intervention. In the bilateral tests, the ID's of the minor currencies were insignificant but this was not entirely surprising given the limited "data" on which they were based. On the other hand, the ID's for the pound-dollar-franc triangle were more complete and were clearly important. On the basis of this, the misvaluation (already discussed) of some currencies and the inter-pretation of some of the residuals, two main conclusions can be drawn: firstly, that the major exchange rates were influenced by official intervention and secondly, that the evidence does tend to support the widely held view that the pound was deliberately held down in the early 1930's.[7]

Another possible interpretation of large residuals is that
they are caused by the (unmodelled) effects of protection. This was
widespread in the 1930's and, just as it affected the flow of goods,
it would also have affected the flow of currencies. Trade controls
are important because they are widely acknowledged to cause deviations
from PPP. No positive evidence relating to the significance of this
influence was presented: a rather crude attempt to model the effects
of protection in the Canadian case was unsuccessful and it was not
possible to derive even a crude indicator for protection in any other
cases. To the extent that relative prices did show up and residuals
could be satisfactorily explained, it might be argued that trade
controls did not influence exchange rates (with the exception of
the guilder-pound exchange rate where the poor showing of "economic
fundamentals" was attributed in part to the effects of protection).
In the face of no direct evidence though, a more cautious conclusion
may be appropriate: namely, that the effects of the widespread trade
controls on exchange rates seem to have been rather weaker than expected.

The aspect of the study that is most innovative is the calculation
of EER's for the 1930's. The use of EER's to test the central hypothesis
of the study was probably the least successful part of the thesis although
the contention that "economic fundamentals" were important did receive
some support in the shape of the lesser variability of real EER's and
the regression results for two of the three major currencies in the
1930's (the dollar and the franc); moreover, there was no positive
evidence that destabilising speculation was dominant. In any case,
the most important contribution of the section on multilateral exchange
rates probably lies in the examination of the methodology, its application
to the 1930's (especially) and the drawing of a few general inferences
concerning the course of multilateral as opposed to bilateral exchange
rates.

(III)

      Ultimately, the study is principally concerned with whether
or not the 1930's can justifiably be portrayed as a period of exchange
rate near-anarchy, more specifically whether or not exchange rates
were determined primarily by "economic fundamentals" or were determined
by the activities of speculators. The results here would give qualified
support to the former interpretation. Exchange rates do seem to have
been largely determined by "economic fundamentals" and were relatively
"stable" in that sense. Speculation, sometimes destabilising, did play
a minor role but such "instability" that did occur was due, in a large
part, to government interference. Indeed, it might be argued that
this latter observation provides the most important conclusion of
the study. The central hypothesis has been that exchange rates were
determined by economic fundamentals and much effort has gone into
examining the traditional counter-argument (put forward by Nurkse
for the 1930's) that this was not so because of private destabilising
speculation. However, the results are consistent with the view that
such instability as occurred had government rather than private origins
and that the real threat to exchange rate stability in the 1930's was
provided by the activities of governments rather than private indi-
viduals. This is an interpretation that might usefully be applied
to other periods of allegedly "unstable" floating exchange rates.

FOOTNOTES TO CHAPTER 12

1. See Hodgson (1971), pp. 268-9 and Hudgins (1973), p. 222.

2. These latter two variables are not obviously "economic fundamentals" but they are included in that group for two reasons: firstly, they almost certainly do not reflect speculative influences and secondly, and most important, they represent genuinely "economic" effects to the extent that seasonal variation takes place because of the unevenness of crop movements and tourism during the year and the trend variable represents changes in tastes and/or productivity.

3. Interest rate differentials were not even included in the multilateral tests of the model because of the difficulties involved in constructing a suitable variable.

4. Nurkse (1944), p. 138.

5. Indeed, it is probably inappropriate to look at multilateral exchange rates in this context in some cases. For example, a feeling during the 1933-36 period that the French franc was going to leave the gold standard and depreciate could have led to an outflow of funds, but almost certainly not to other members of the gold bloc or to a small country like Canada. Consequently, speculative capital flows would only affect some of the bilateral components of the multilateral exchange rate and there may even be offsetting forces at work within the latter if the "minor" gold bloc currencies weakened in sympathy (due to a capital outflow).

6. This is not an uncommon phenomenon. Similar situations where government interference caused such problems were described in Chapter 2. Examples are the French franc in 1924-26 and the Canadian dollar in 1960-1.

7. Two other important issues - whether intervention was competitive and whether it had a stabilising or destabilising effect on exchange rates - have not been properly addressed and no specific conclusions are offered.

APPENDIX I

DETAILS OF CONSTRUCTED VARIABLES

(1) Seasonal Variables (Sine and Cosine Waves)

	A1	A2	A3	A4
J	0.5	-0.866025	1	-0.866025
F	0	0	0	0
M	-0.5	0.866025	-1	0.866025
A	-0.866025	0.866025	0	-0.866025
M	-1.0	0	1	0
J	-0.866025	-0.866025	0	0.866025
J	-0.5	-0.866025	-1	-0.866025
A	0	0	0	0
S	0.5	0.866025	1	0.866025
O	0.866025	0.866025	0	-0.866025
N	1.0	0	-1	0
D	0.866025	-0.866025	0	0.866025

	A5	B1	B2	B3
J	0.5	-0.866025	0.5	0
F	0	-1.0	1.0	-1
M	-0.5	-0.866025	0.5	0
A	0.866025	-0.5	-0.5	1
M	-1.0	0	-1.0	0
J	0.866025	0.5	-0.5	-1
J	-0.5	0.866025	0.5	0
A	0	1.0	1.0	1
S	0.5	0.866025	0.5	0
O	-0.866025	0.5	-0.5	-1
N	1.0	0	-1.0	0
D	-0.866025	-0.5	-0.5	1

	B4	B5	B6	A6
J	-0.5	0.866025	-1	1
F	1.0	-1.0	1	-1
M	-0.5	0.866025	-1	1
A	-0.5	-0.5	1	-1
M	1.0	0	-1	1
J	-0.5	0.5	1	-1
J	-0.5	-0.866025	-1	1
A	1.0	1.0	1	-1
S	-0.5	-0.866025	-1	1
O	-0.5	0.5	1	-1
N	1.0	0	-1	1
D	-0.5	-0.5	1	-1

(2) Speculative Dummies

British Speculative Dummies are given in Table 5.1, p. 144.

American "   "   "   "   "   " 5.2, p. 150.

French "   "   "   "   "   " 5.3, p. 157.

Belgian "   "   "   "   "   " 6.1, p. 220.

Dutch "   "   "   "   "   " 6.2, p. 226.

Swiss "   "   "   "   "   " 6.3, p. 231.

Canadian "   "   "   "   "   " 7.3, p. 289.

(3) Official Intervention Dummies

		POUND-DOLLAR		POUND-FRANC		DOLLAR-FRANC	
		Narrow	Wide	Narrow	Wide	Narrow	Wide
1931	S						
	O						
	N						
	D						
1932	J						
	F						
	M	-1	-1	-1	-1		
	A						
	M						
	J						
	J		-1				
	A		-1				
	S	+1	+1	+1	+1		
	O		+1				
	N		-1				
	D		-1				
1933	J	-1	-1	-1	-1		
	F	-1	-1	-1	-1		
	M	-1	-1	-1	-1		
	A		-1				
	M		-1		+1		
	J		+1		-1		
	J		+1	+1	+1		
	A	-1	-1	-1	-1		
	S	-1	-1	-1	-1		
	O		-1		-1		
	N		+1		-1		
	D		+1				
1934	J				-1		
	F		+1				
	M			+1	+1		
	A		+1				
	M		+1	+1	+1		

		POUND-DOLLAR		POUND-FRANC		DOLLAR-FRANC	
		Narrow	Wide	Narrow	Wide	Narrow	Wide
	J		+1	+1	+1		
	J	+1	+1		+1		
	A		-1	+1	+1		-1
	S		+1		+1		
	O						
	N						
	D		+1				
1935	J	+1	+1			+1	+1
	F	+1	+1		+1	+1	+1
	M		-1		+1		
	A						
	M		-1	-1	-1		
	J						
	J		+1				
	A		-1		-1		
	S		+1	+1	+1		
	O		+1	+1	+1		
	N		-1		-1		
	D				-1		
1936	J		-1		-1		+1
	F				-1		
	M		+1		-1		
	A		-1	-1	-1		
	M			-1	-1		
	J		+1	-1	-1		
	J		-1		+1		
	A				-1		
	S		+1		-1		
	O		+1				
	N		+1	-1	-1		
	D			-1	-1		
1937	J			-1	-1		
	F			-1	-1		
	M						
	A		+1				+1
	M	+1	+1				

	POUND-DOLLAR		POUND-FRANC		DOLLAR-FRANC	
	Narrow	Wide	Narrow	Wide	Narrow	Wide
J		-1		-1		-1
J		-1	+1	+1		-1
A		-1		-1		+1
S		+1				+1
O				+1		-1
N	-1	-1	+1	+1	-1	-1
D						
1938 J						
F				-1		-1
M						
A						
M	+1	+1	+1	+1	-1	-1
J		+1				
J		+1		-1		+1
A		+1				
S		+1				
O		+1		-1		+1
N		+1		-1		+1
D	+1	+1	+1	+1		-1

Belgian ID		Dutch ID		Swiss ID	
Feb., 1938	-1	Nov., 1936	+1	March, 1933	+1
March, 1938	-1	Dec., 1936	+1	April, 1935	+1
July, 1938	+1	Jan., 1937	+1	Nov., 1936	-1
		March, 1938	+1		
		April, 1938	+1		
		May, 1938	+1		
		Sept., 1938	-1		

APPENDIX II

DATA SOURCES

(1) Spot Exchange Rates

These were taken from several sources in order to obtain direct
quotations as far as possible. (Any exchange rate used in the study
but not listed below has been based on cross-rates). For some exchange
rates two sources had to be used and the respective dates are given in
these cases; where no dates are given the source gave the exchange rate
for the entire 1929-38 period.

(i) Sterling exchange rates

L.C.E.S. (London and Cambridge Economic Service) Bulletin: U.S.A.,
Brazil, Argentina, India, Japan, Czechoslovakia, France, Germany,
Italy, Netherlands, Sweden, Switzerland.

Bank of England Statistical Summary (all 1932-8 only): S. Africa,
Canada, China, Belgium, Denmark, Finland, Norway, Spain, Australia,
New Zealand.

Economist: Egypt, Canada (1929-31), China (1929-31), Russia, Austria,
Belgium (1929-31), Denmark (1929-31), Finland (1929-31), Norway (1929-31),
Poland, Spain (1929-31).

League of Nations Monthly Bulletin (all 1929-31): S. Africa, Australia,
New Zealand.

League of Nations, The Network of World Trade (1942): British Malaya.

(ii) U.S. Dollar exchange rates

Federal Reserve Bulletin: Argentina, Austria, Belgium, Brazil,
Canada, China, Czechoslovakia, Denmark, Egypt, Finland, France,
Germany, India, Italy, Japan, Mexico, Netherlands, Norway, Poland,
Portugal, Spain, Sweden, Switzerland.

(iii)   Canadian Dollar Exchange Rates

The Canadian Yearbook (all 1930-38): Argentina, Australia, Austria, Brazil, China, Czechoslovakia, Denmark, Finland, France, Germany, India, Italy, Japan, Mexico, Netherlands, Norway, Spain, Sweden.

(iv)   French Franc Exchange Rates

Bulletin de la Statistique Générale de la France: Norway (1933-8), Spain (1931-8).

Ministère de l'Economic Nationale, Annuaire Statistique: Czechoslovakia, Finland (1935-8), Germany, Italy, Poland (1933-8), Netherlands, Spain (1929-30), Sweden.

(v)   Belga Exchange Rates

Ministère de L'Intérieur, Office Centrale de la Statistique, Annuaire Statistique de la Belgique et du Congo Belge: Canada, Czechoslovakia, Denmark, France, Germany, Italy, Netherlands, Norway, Poland, Spain, Sweden, Switzerland.

(vi)   Swiss Franc Exchange Rates

Annuaire Statistique de la Swisse: Austria, France, Germany, Italy, Netherlands, Spain, Sweden.

(vii)   Dutch Guilder Exchange Rates

These were all based on cross-rates.

(2) Forward Exchange Rates

1931-6: Einzig (1937), Appendix I.
1937-8: Economist.

(3) Prices

Bulletin de la Statistique de la France: French cost-of-living index.

Economist, Statist, Board of Trade: U.K. wholsale price index is an average of three completely separate indices calculated by these sources.

League of Nations Monthly Bulletin of Statistics: all other price indices.

(4) Wages

U.K.: L.C.E.S. Bulletin.

U.S.: U.S. Department of Commerce, Survey of Current Business.

(5) Income Variables (Employment, Unemployment and Production Indices)

International Labour Review: S. Africa (1932-8), Czechoslovakia (1933-8), Germany (1931-8), Italy (1931-8), Japan (1931-8), Poland (1931-8).

League of Nations Monthly Bulletin: all other "income" indices.

(6) Interest Rates

1931-6: Einzig (1937), Appendix III.

1937-8: League of Nations Monthly Bulletin.

APPENDIX III

EFFECTIVE EXCHANGE RATES:

METHODS OF CONSTRUCTION AND DATA

Twelve indices were calculated for each of the six countries based on trade flows in 1928, 1935 and 1938: four indices were based on bilateral trade flows, one for each year and one (the average bilateral) averaging the weights of each year; four were based on shares of total world trade ("global" weights), one for each year and one (the average global) averaging the weights for each year; and four were based on averaging the bilateral and global weights, one for each year and the "composite index" which averaged the average bilateral and average global weights. All the averages were geometric in the case of the pound and arithmetic for the other six countries. The indices were calculated according to the simple formula:

$$\text{Index in time period } i = \frac{1}{n} \Sigma w \, R^i$$

where n = the number of countries

R = the index of the value of a bilateral exchange rate $(R^o = 1.00)$

R^i = the index for an exchange rate in time period i

w = a weight

The data presented in the following pages is based on the following key:

K	= U.K.	S = U.S.	C	= Canada
F	= France		H	= Holland
B	= Belgium		W	= Switzerland

The following indices are 1929 based using a 29 country model except for the pound (1929-30 based, 28 countries). The weights follow the indices.

1 = 1928 weights, bilateral

2 = 1935 " "

3 = 1938 " "

4 = average bilateral

5 = 1928 weights, global

6 = 1935 " "

7 = 1938 " "

8 = average global

9 = average of bilateral and global weights, 1928

10 = " " " " " " 1935

11 = " " " " " " 1938

12 = Composite index

The following data is also presented:

13 = (WP) 28 country EER

14 = ROW 28 country WP index (used to calculate WP adjusted EER)

15 = (COL) 24 country EER

16 = ROW 24 country COL index (used to calculate COL adjusted real EER)

17 = 7 country EER

18 = ROW 7 country WP index

19 = " " " COL index

20 = " " " "income" index

21 = 7 country real EER (WP adjusted), quarterly.

22 = " " " " (COL adjusted), "

23 = Weights used for all 7 country variables

In addition one further index is presented for the pound only:

24 = 1929 based composite EER (i.e. 1929 based version of K12).

1931

	K1	K2	K3	K5	K6	K7
JAN	105.306	105.175	104.650	107.227	106.184	105.868
FEB	106.249	106.236	105.794	108.151	106.990	106.583
MAR	105.406	105.513	105.241	107.444	106.447	106.259
APR	105.717	105.877	105.551	107.899	106.890	106.671
MAY	106.776	106.798	106.281	108.865	107.719	107.401
JUNE	106.789	106.767	106.246	108.760	107.568	107.180
JULY	106.901	106.899	106.321	108.906	107.757	107.538
AUG	107.938	106.876	107.108	108.853	108.534	108.070
SEPT	104.335	107.876	104.105	104.806	103.597	103.356
OCT	95.477	104.771	96.020	93.527	92.409	92.531
NOV	92.613	96.391	93.928	89.562	89.045	89.354
DEC	93.035	93.972	89.978	84.129	93.745	94.229

1932

	K1	K2	K3	K5	K6	K7
JAN	92.977	90.718	90.736	86.063	95.660	86.028
FEB	89.479	91.114	90.942	86.937	86.443	86.759
MAR	91.946	93.248	93.002	90.220	89.730	89.823
APR	93.947	95.293	93.944	92.551	89.990	92.018
MAY	93.160	94.544	94.278	91.593	91.013	91.103
JUNE	92.818	84.265	94.638	91.502	90.948	91.047
JULY	91.655	93.248	93.082	90.144	89.736	89.736
AUG	90.482	92.186	92.030	88.829	88.564	88.618
SEPT	90.157	91.213	91.657	88.622	88.407	88.430
OCT	98.235	90.935	90.808	87.611	88.475	87.438
NOV	87.575	89.447	89.343	85.811	85.701	95.709
DEC	87.578	88.404	89.331	86.358	85.629	85.567

1933

	K1	K2	K3	K5	K6	K7
JAN	90.087	92.236	92.042	88.054	88.009	87.970
FEB	92.011	94.640	94.387	89.808	89.800	89.844
MAR	92.226	94.695	94.622	89.912	89.899	90.019
APR	92.757	95.177	95.122	90.792	90.667	90.817
MAY	93.787	96.157	96.301	91.786	91.516	91.886
JUNE	94.624	96.918	97.111	92.592	92.239	92.562
JULY	96.255	98.402	98.744	94.281	93.654	94.032
AUG	95.270	97.416	97.810	93.265	92.720	93.051
SEPT	94.631	96.887	97.369	92.330	91.732	92.135
OCT	94.543	96.777	97.279	92.106	91.511	91.923
NOV	97.232	99.208	95.736	95.083	94.238	94.654
DEC	98.668	100.554	100.846	96.307	95.559	95.724

1934

	K1	K2	K3	K5	K6	K7
JAN	97.908	99.901	100.228	95.292	94.366	94.800
FEB	99.037	101.015	101.102	95.248	94.077	94.518
MAR	99.436	101.350	101.451	95.596	94.347	94.783
APR	100.252	102.088	102.119	96.420	95.072	95.470
MAY	100.481	102.277	102.220	96.372	94.947	95.309
JUNE	99.475	101.285	101.312	95.389	94.073	94.482
JULY	98.869	101.724	101.718	96.159	94.873	95.397
AUG	98.638	100.574	100.730	95.065	93.898	94.442
SEPT	97.751	98.766	98.946	93.795	92.704	93.240
OCT	97.537	99.536	99.738	93.470	92.404	92.911
NOV	98.569	100.506	100.574	94.704	93.535	93.990
DEC	98.425	100.424	100.490	94.437	93.295	93.798

1935

	K1	K2	K3	K5	K6	K7
JAN	97.784	98.846	98.941	93.732	92.672	93.211
FEB	97.307	98.444	98.619	93.194	92.200	92.783
MAR	96.457	98.726	98.809	91.954	91.049	91.771
APR	97.954	91.906	100.033	93.626	92.572	92.661
MAY	98.585	100.447	100.508	94.515	93.760	94.610
JUNE	98.919	100.503	100.930	95.051	94.254	95.111
JULY	99.114	100.467	101.055	95.334	94.504	95.324
AUG	99.314	101.125	101.240	95.697	94.791	95.581
SEPT	98.961	100.378	101.003	95.270	94.544	95.244
OCT	99.573	100.462	100.619	95.877	94.909	94.795
NOV	98.116	100.367	100.963	95.735	94.717	95.313
DEC	99.154	100.921	101.043	95.864		95.442

1936

	K1	K2	K3	K5	K6	K7
JAN	98.382	101.082	101.158	96.096	95.019	95.616
FEB	99.406	101.101	101.205	96.090	95.029	95.629
MAR	99.323	101.029	101.122	96.056	95.010	95.596
APR	99.257	100.968	101.055	96.018	94.581	95.571
MAY	98.454	101.148	101.234	96.249	95.229	95.788
JUNE	98.927	101.085	101.234	96.823	95.698	96.318
JULY	99.980	101.619	101.089	96.782	95.688	96.255
AUG	98.956	101.601	101.333	96.855	95.773	96.273
SEPT	100.108	101.730	101.756	97.115	96.094	96.528
OCT	102.020	103.228	103.031	100.523	100.351	100.134
NOV	101.861	103.089	102.899	100.599	100.189	99.475
DEC	101.379	102.635	102.532	100.440	100.018	99.799

	K1	K2	K3	K5	K6	K7
1937						
JAN	101.229	162.500	102.422	100.334	99.931	99.777
FEB	101.141	102.446	102.332	100.177	99.778	99.553
MAR	100.987	102.301	102.203	100.017	99.672	99.423
APR	101.450	102.706	102.620	100.654	100.315	100.008
MAY	101.672	102.908	102.819	100.927	100.580	100.250
JUNE	101.615	102.857	102.773	100.869	100.531	100.179
JULY	103.045	104.239	104.080	103.024	102.958	102.223
AUG	103.224	104.251	104.081	105.312	103.253	102.491
SEP	103.45	104.398	104.198	103.725	103.796	102.194
OCT	104.013	104.935	104.687	104.712	104.884	103.864
NOV	104.404	105.307	105.043	105.111	105.221	104.28
DEC	104.627	105.518	105.234	105.534	105.478	104.492
1938						
JAN	104.676	105.544	105.257	105.435	105.565	104.477
FEB	105.803	106.582	106.189	106.349	106.449	105.252
MAR	106.319	107.021	106.501	107.015	107.153	105.859
APR	106.565	107.215	106.671	107.344	107.437	106.033
MAY	107.355	107.830	107.214	108.873	108.063	107.267
JUNE	108.165	108.335	107.638	110.181	110.073	107.527
JULY	107.926	103.125	107.47	109.991	109.875	107.684
AUG	107.839	107.955	107.193	110.021	109.800	107.455
SEP	107.191	107.406	106.654	109.088	108.894	106.704
OCT	107.054	107.251	106.471	109.014	108.840	106.438
NOV	107.167	107.345	106.471	108.714	108.587	106.142
DEC	106.930	107.154	106.270	108.260	108.033	105.693
1939						
JAN	106.771	107.018	106.114	108.127	107.980	105.596
FEB	106.987	107.187	106.339	108.415	108.215	105.810
MAR	106.975	107.172	106.290	109.421	108.229	105.836
APR	107.115	107.323	106.444	108.653	108.460	106.076
MAY	107.130	107.344	106.432	108.696	108.474	106.110
JUNE	107.592	107.965	106.853	109.944	109.405	106.734
JULY	108.919	108.561	107.408	111.655	110.636	107.557
AUG	110.328	109.624	108.109	115.272	113.002	108.782

	K1	K2	K3	K5	K6	K7
EGYPT	2.135	1.987	1.703	0.997	1.121	1.021
S. AFRICA	3.253	4.616	4.519	1.266	1.901	2.071
CANADA	5.326	7.557	8.413	5.371	4.879	5.254
U.S.A.	14.571	11.297	12.123	16.339	13.969	14.192
BRAZIL	1.194	1.169	1.079	1.907	1.873	2.052
ARGENTINA	6.143	5.707	4.788	3.806	3.154	2.995
INDIA, BURMA, CEYLON	9.616	8.921	8.020	4.805	4.475	4.388
BRITISH MALAYA	1.585	1.773	1.959	1.841	2.053	2.001
JAPAN, KOREA, FORMOSA	1.256	1.208	0.927	4.293	4.527	4.012
CHINA	1.661	1.091	0.860	2.760	1.933	1.205
RUSSIA	1.439	3.039	3.035	1.668	1.845	1.735
AUSTRIA	0.316	0.312	0.270	1.296	1.137	1.212
BELGIUM-LUXEMBURG	4.036	2.865	2.630	3.528	4.275	4.826
CZECHOSLOVAKIA	0.590	0.565	0.309	2.182	1.897	1.853
FRANCE	6.019	5.045	4.654	10.417	12.284	9.944
GERMANY	7.412	5.454	4.704	12.004	10.827	11.705
ITALY	1.819	1.519	1.079	3.646	3.390	2.999
NETHERLANDS	5.113	4.353	4.451	5.944	6.332	6.757
SWEDEN	1.867	2.649	3.102	1.859	2.698	3.360
SWITZERLAND	1.533	1.013	0.961	1.838	2.430	2.258
DENMARK	3.533	4.600	4.451	1.931	2.205	2.472
FINLAND	0.975	1.576	2.074	0.957	0.985	1.297
NORWAY	1.153	1.461	1.551	0.962	1.365	1.713
POLAND-DANZIG	0.673	1.182	1.446	1.355	1.249	1.540
SPAIN	1.653	1.636	0.829	1.872	1.653	0.792
IRELAND	5.079	4.227	4.030	1.125	1.117	1.146
AUSTRALIA	6.356	8.083	9.138	2.944	3.198	3.599
NEW ZEALAND	3.809	4.967	5.463	1.045	1.265	1.603

		K4	K8	K9	K10	K11	K12
1	•	104.193	103.081	104.028	103.609	103.147	103.453
2	•	105.222	103.800	104.861	104.666	103.989	104.236
3	•	104.530	103.300	104.128	104.068	103.560	103.661
4	•	104.883	103.736	104.543	104.457	103.908	104.043
5	1931•	105.758	104.559	105.502	105.306	104.622	104.873
6	•	105.727	104.393	105.447	105.216	104.497	104.779
7	•	105.829	104.575	105.570	105.356	104.619	104.904
8	•	106.753	105.361	106.532	106.220	105.337	105.741
9	•	105.518	100.510	102.162	102.103	101.358	101.534
10	•	95.1080	89.6047	91.8634	92.1713	91.7536	91.6079
11	•	92.6700	86.3049	88.6194	89.3442	89.1631	88.6054
12	•	88.4343	81.0220	83.4621	84.4694	84.4654	83.6590
13	•	89.2462	82.7463	84.7266	85.6781	85.5672	84.8802
14	•	89.5898	83.3721	85.2778	86.1752	85.9396	85.3396
15	•	91.7781	86.5832	88.1484	88.9161	88.5280	88.0925
16	•	93.7973	88.8478	90.4158	91.1049	90.6593	90.2921
17	•	93.0215	87.7149	89.3680	90.0848	89.7046	89.2767
18	1932•	92.7046	87.5456	89.0499	89.8077	89.4481	88.9888
19	•	91.6980	86.5023	87.8323	88.7385	88.3772	87.8654
20	•	90.6621	85.5035	86.6978	87.6716	87.3245	86.7564
21	•	90.3083	85.3453	86.4169	87.4026	87.0358	86.5505
22	•	89.4341	84.3940	85.4261	86.4540	86.1005	85.3865
23	•	87.9054	82.7116	83.6694	84.7662	84.4256	83.7859
24	•	87.8892	82.6356	83.6696	84.7225	84.3419	83.7398
25	•	90.5739	84.9206	85.9499	87.2161	86.8365	86.2395
26	•	92.6877	86.6137	87.6625	89.1067	88.7772	87.9991
27	•	92.6942	86.6705	87.7935	89.2439	88.9594	88.1552
28	•	93.3541	87.2973	88.4005	89.8099	89.5428	88.7537
29	•	94.5572	88.4735	89.9053	91.3123	91.2272	90.4222
30	1933•	95.4137	89.3265	90.9482	92.3198	92.2849	91.5041
31	•	97.1264	91.0336	93.1069	94.3921	94.4308	93.7617
32	•	96.1624	90.0501	91.9866	93.3195	93.3724	92.6315
33	•	95.6784	89.2304	91.4191	92.4355	92.7793	92.1870
34	•	95.5997	89.0598	91.3141	92.7002	92.8320	92.0856
35	•	98.2078	91.9612	94.5191	95.7379	95.9575	95.2924
36	•	99.4659	92.9935	95.7492	96.8434	96.9436	96.3877
37	•	98.7922	92.0468	94.8407	96.0052	96.1455	95.5323
38	•	99.8438	91.9053	95.3968	96.4544		95.9321
39	•	100.236	92.2636	95.8150	96.7983	96.8673	96.3697
40	•	100.983	93.0276	96.6797	97.5765	97.6051	97.1727
41	1934•	101.145	92.9002	96.5507	97.5246		97.1367
42	•	100.197	92.0805	95.7607	96.6446	96.6725	96.2276
43	•	100.607	92.9220	96.3201	97.2366	97.2843	96.8119
44	•	99.5028	91.9357	95.2220	96.2594	96.3925	95.8353
45	•	98.6797	90.7479	94.1312	95.2362	95.3953	94.7890
46	•	98.4738	90.4332	93.8183	94.9393	95.0634	94.4616
47	•	99.3983	91.5219	94.9258	95.9434	96.0036	95.4818
48	•	99.2835	91.2978	94.6935	95.7490	95.9255	95.2735
49	•	98.6979	90.6959	94.0177	95.1341	95.2395	94.7165
50	•	98.3074	90.2346	93.5186	94.7117	94.8655	94.2096
51	•	97.5457	89.1791	92.4679	93.7564	93.9596	93.2253
52	•	98.7992	90.9161	94.0489	95.2375	95.4507	94.7531
53	•	99.4020	91.8173	94.8284	96.0044	96.2303	95.5415
54	1935•	99.7261	92.3192	95.2844	96.4431	96.6711	95.9946
55	•	99.8966	92.5642	95.5364	96.6588	96.8733	96.2190
56	•	100.068	92.8540	95.8116	96.8937	97.0918	96.4612
57	•	99.7530	92.4934	95.4104	96.5374	96.7447	96.0868
58	•	99.3873	92.0923	95.0165	96.1475	96.3491	95.6859
59	•	99.8051	92.7287	95.6925	96.6674	96.7695	96.2135
60	•	99.8588	92.8396	95.7810	96.7472	96.8474	96.2962
61	•	100.032	93.0253	96.0025	96.9451	97.1335	96.5060
62	•	100.070	93.0493	96.0631	97.0060	97.1149	96.5805
63	•	99.9847	93.0148	95.9762	96.9251	97.0211	96.4873
64	•	99.9132	92.9779	95.9004	96.8496	96.9409	96.3638
65	•	100.102	93.2053	96.1351	97.0778	97.1665	96.6383
66	1936•	100.546	93.7417	96.6794	97.5912	97.6720	97.1681
67	•	100.585	93.6868	96.6364	97.5830	97.6558	97.1631
68	•	100.555	93.7544	96.7281	97.6326	97.6575	97.1900
69	•	100.685	94.0450	96.9557	97.8534	97.8603	97.4073
70	•	102.210	97.8526	99.5936	100.312	99.9220	99.7216
71	•	102.065	97.6944	99.3300	100.152	99.7652	99.5565
72	•	101.637	97.5053	99.0001	99.8658	99.5193	99.2741
73	•	101.506	97.4147	98.8752	99.7597	99.4263	99.1748
74	•	101.416	97.2540	98.7431	99.6282	99.2891	99.0314
75	•	101.270	97.1091	98.5336	99.4451	99.0875	98.8200
76	•	101.712	97.7466	99.1459	100.037	99.6662	99.4311
77	•	101.923	98.0104	99.4084	100.285	99.9047	99.6848
78	1937•	101.870	97.9496	99.3475	100.224	99.8413	99.6235
79	•	103.230	100.156	101.113	102.027	101.459	101.350
80	•	103.307	100.442	101.353	102.187	101.505	101.455
81	•	103.454	100.889	101.621	102.464	101.315	101.701
82	•	103.992	101.899	102.382	103.214	102.495	102.511
83	•	104.371	102.270	102.805	103.606	102.886	102.920
84	•	104.578	102.538	103.048	103.835	103.111	103.153
85	•	104.603	102.576	103.099	103.882	103.109	103.183
86	•	105.622	103.426	104.107	104.801	103.940	104.102
87	•	105.051	104.074	104.644	105.299	104.341	104.570
88	•	106.249	104.333	104.917	105.515	104.513	104.783
89	•	106.878	105.767	106.019	106.512	105.324	105.737
90	•	107.478	106.716	107.038	107.258	105.870	106.477
91	•	107.217	106.493	106.801	107.001	105.589	106.209
92	•	107.042	106.372	106.722	106.810	105.317	106.009

	K4	K8	K9	K10	K11	K12
EGYPT	1.93300	1.04500	1.460	1.473	1.319	1.42100
S.AFRICA	4.07900	1.70800	2.030	2.363	3.060	2.64000
CANADA	6.97000	5.16400	5.369	6.073	6.644	5.99900
U.S.A.	13.7820	15.9230	19.755	18.113	18.509	20.0630
BRAZIL	1.14600	1.94300	1.509	1.440	1.489	1.49200
ARGENTINA	5.51600	3.30000	4.856	4.263	3.787	4.26600
INDIA	9.18100	4.55300	6.798	6.311	6.292	6.46500
BRITISH MALAYA	1.76000	1.95600	1.711	1.891	1.970	1.85600
JAPAN	1.12000	4.27200	2.323	2.031	1.924	2.18700
CHINA	1.15900	1.35900	2.142	1.443	1.019	1.46800
RUSSIA	2.39500	1.74800	1.577	2.368	2.215	2.04600
AUSTRIA	0.299000	1.21300	0.644	0.594	0.573	0.602000
BELGIUM-LUXEMBOURG	3.09900	4.17700	3.774	3.665	3.563	3.59800
CZECHOSLOVAKIA	0.645000	1.97200	1.195	1.036	1.215	1.12900
FRANCE	5.09000	10.8360	7.919	7.873	6.803	7.51300
GERMANY	5.75100	11.5010	9.693	7.685	7.641	8.13300
ITALY	1.43900	3.33400	2.576	2.270	1.799	2.19000
NETHERLANDS	4.03800	6.33700	5.516	5.263	5.485	5.42100
SWEDEN	2.48500	2.56400	1.814	2.674	3.229	2.52400
SWITZERLAND	1.09200	2.16400	1.514	1.570	1.493	1.54400
DENMARK	4.14300	2.19200	2.631	3.317	3.317	3.01300
FINLAND	1.55800	1.06900	0.167	1.358	1.444	1.29100
NORWAY	1.37700	1.30100	1.043	1.443	1.630	1.33800
POLAND-DANZIG	1.04200	1.37500	0.915	1.219	1.477	1.19700
SPAIN	1.29300	1.36300	1.744	1.635	1.477	1.31800
IRELAND	4.42300	1.42900	2.391	2.174	0.801	2.23500
AUSTRALIA	7.77200	2.71800	4.326	5.364	2.150	4.59600
NEW ZEALAND	4.09300	1.23400	1.996	2.507	2.960	2.45500

The weights are the same as for K12

	K24			K24			K24
1	100.743		47	96.2536		93	102.831
2	101.072		48	97.4246		94	103.662
3	101.372		49	96.5548		95	104.085
4	101.126		50	97.0589		96	104.332
5 (1930)	101.301		51	97.5087		97	104.354
6	101.938		52	98.3367		98	105.223
7	102.193		53	98.3401		99	105.812
8	102.449		54 (1934)	97.3900		100	106.047
9	102.329		55	98.0116		101 (1938)	107.032
10	102.779		56	96.9680		102	107.971
11	102.610		57	95.9032		103	107.611
12	103.130		58	95.5753		104	107.449
13	104.666		59	96.6364			106.647
14	105.499		60	96.4327			106.463
15	104.859		61	95.8515			106.318
16	105.246		62	95.3204			105.929
17	106.168		63	94.3205			105.794
18 (1931)	106.071		64	96.0596			104.036
19	106.192		65	96.6579			106.035
20	107.119		66	97.1207			104.222
21	102.875		67	97.3513			104.254
22	92.8320		68	97.6090			107.066
23	89.7074		69	97.2200			108.139
24	84.6825		70	96.8091			110.055
25	85.8998		71	97.1919			
26	84.3807		72 (1935)	97.4776			
27	89.1680		73	97.6930			
28	91.4127		74	97.7585			
29	90.3740		75	97.6649			
30 (1932)	90.0615		76	97.5421			
31	88.9168		77	98.2542			
32	87.7630		78 (1936)	98.3526			
33	87.5386		79	98.3794			
34	86.3597		80	98.5948			
35	84.7228		81	100.896			
36	84.6944		82	100.727			
37	87.2117		83	100.412			
38	88.9783		84	100.303			
39	89.1320		85	100.158			
40 (1933)	89.7371		86	99.9451			
41	91.3874		87	99.7371			
42	92.4759		88 (1937)	100.552			
43	94.7478		89	100.806			
44	93.6029		90	100.739			
45	93.1272		91	102.474			
46	93.0258		92	102.585			

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
1	100.753	100.518	100.316	100.529	100.590	100.362	100.175	100.376	100.672	100.440	100.245	100.452
2	101.184	100.905	100.613	100.901	101.102	100.788	100.536	100.809	101.143	100.847	100.574	100.855
3	101.135	100.835	100.463	100.811	101.218	100.868	100.570	100.885	101.176	100.851	100.516	100.848
4	100.903	100.604	100.237	100.581	101.052	100.733	100.459	100.748	100.977	100.668	100.348	100.665
5	101.235	100.881	100.434	100.850	101.339	100.945	100.613	100.966	101.287	100.913	100.523	100.908
6	102.633	102.005	101.303	101.980	102.352	101.666	101.114	101.711	102.492	101.836	101.209	101.846
7	102.931	102.295	101.572	102.266	102.497	101.775	101.207	101.827	102.714	102.037	101.390	102.047
8	103.136	102.565	101.837	102.513	102.551	101.860	101.294	101.902	102.843	102.213	101.566	102.207
9	103.057	102.527	101.802	102.462	102.613	101.951	101.400	101.988	102.835	102.239	101.601	102.225
10	103.567	102.996	102.175	102.914	103.093	102.352	101.735	102.395	103.330	102.674	101.959	102.654
11	103.612	103.004	102.322	102.979	102.981	102.295	101.757	102.346	103.297	102.652	102.040	102.663
12	104.493	103.760	102.902	103.718	103.625	102.85	102.090	102.834	104.059	103.272	102.496	104.276
13	106.312	105.348	104.263	105.308	105.202	104.076	103.277	104.185	105.757	104.712	103.770	104.746
14	107.476	106.320	105.071	106.289	106.046	104.794	103.912	104.917	106.761	105.557	104.492	105.603
15	106.775	105.780	104.805	105.787	105.259	104.231	103.578	104.356	106.017	105.005	104.192	105.071
16	107.578	106.534	105.533	106.548	105.715	104.617	103.939	104.757	106.647	105.576	104.736	105.653
17	108.810	107.674	106.576	107.687	106.570	105.290	104.541	105.467	107.690	106.492	105.558	106.577
18	108.185	107.048	106.121	107.013	106.453	105.098	104.276	105.275	107.319	106.073	105.041	106.144
19	108.491	107.366	106.421	107.326	106.758	105.418	104.640	105.605	107.624	106.392	105.381	106.466
20	112.191	110.886	109.421	110.833	108.116	107.344	105.792	107.084	110.154	109.115	107.607	108.958
21	115.220	114.070	112.714	114.001	111.411	110.429	109.290	110.377	113.315	112.250	111.002	112.189
22	121.508	120.855	115.352	120.571	116.194	117.223	116.824	117.414	119.851	119.039	118.088	118.993
23	121.714	121.651	120.244	121.203	115.925	115.184	119.147	119.416	120.819	120.417	119.695	120.311
24	128.481	128.892	127.244	128.205	126.056	125.395	125.659	125.717	127.219	127.143	126.451	126.951
25	129.331	129.913	128.086	129.110	126.148	125.350	125.491	125.676	127.759	127.651	126.789	127.393
26	129.061	129.766	127.741	128.856	125.793	125.107	125.005	125.303	127.427	127.436	126.375	127.080
27	128.127	128.690	126.508	127.775	123.752	123.165	122.574	123.163	125.939	125.928	124.541	125.469
28	126.813	127.201	125.015	126.343	122.387	121.742	121.004	121.711	124.600	124.471	123.009	124.027
29	128.049	128.493	126.263	127.602	123.318	122.883	122.079	122.760	125.683	125.686	124.171	125.181
30	129.903	130.377	128.034	129.438	124.245	124.045	123.016	123.768	127.074	127.211	125.525	126.603
31	132.422	133.157	130.589	132.056	126.572	126.308	125.307	126.062	129.497	129.733	127.948	129.059
32	134.668	135.751	133.001	134.473	128.344	128.105	127.144	127.864	131.506	131.921	130.073	131.169
33	134.501	135.685	132.881	134.356	128.543	128.258	127.354	128.051	131.522	131.971	130.118	131.204
34	135.371	136.684	133.810	135.288	129.650	129.361	126.577	129.209	132.550	133.023	131.194	132.249
35	139.815	141.446	138.292	139.651	132.878	132.463	131.714	132.352	136.347	134.965	135.003	136.102
36	140.335	141.819	136.579	140.246	133.195	132.668	131.810	132.559	136.769	137.243	135.194	136.402
37	139.516	141.171	138.169	139.619	132.247	132.030	131.069	131.782	135.892	136.601	134.619	135.700
38	140.098	141.658	138.773	140.176	132.001	131.921	130.944	131.622	136.050	136.790	134.859	135.899
39	139.182	140.734	137.987	139.301	131.297	131.298	130.396	130.994	135.239	136.011	134.192	135.147
40	135.074	137.556	134.964	136.198	127.838	127.968	127.086	127.630	131.956	132.762	131.025	131.914
41	135.027	126.307	124.001	125.112	115.753	115.801	114.966	115.507	120.390	121.054	119.483	120.309
42	119.584	120.757	116.662	119.668	110.134	110.427	105.538	110.033	114.859	115.592	114.100	114.850
43	108.820	105.852	108.000	108.890	98.6008	98.9538	98.0059	98.5202	103.710	104.403	103.003	103.705
44	110.717	111.932	105.946	110.865	106.382	100.852	99.9140	100.382	105.550	106.392	104.930	105.624
45	106.900	106.242	106.317	107.153	96.1738	96.7278	95.4376	96.2464	101.537	102.485	101.077	101.700
46	105.846	107.148	105.234	106.076	95.3208	95.3154	95.0497	95.4353	100.583	101.542	100.142	100.756

1930 (rows 1–12)
1931 (rows 13–24)
1932 (rows 25–36)
1933 (rows 37–46)

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
47	99.1837	100.236	98.5205	99.3132	89.4424	89.0852	88.0992	88.5423	93.8130	94.6604	93.1099	93.9278
48	100.078	100.167	99.3523	100.167	89.5370	90.0591	89.0278	89.5396	94.8007	95.5885	94.1901	94.8511
49	100.580	101.692	99.9599	100.744	89.7545	90.1232	89.3572	89.8116	95.1672	96.0078	94.6585	95.2778
50	100.404	101.636	99.9106	106.650	89.1985	89.7752	88.1600	88.2780	94.8013	95.7054	94.1853	94.9640
51	99.3560	100.582	98.9078	99.6151	88.1330	88.6995	87.7743	88.2023	93.7445	94.6405	93.3410	93.9087
52	98.7118	99.8580	98.1821	98.9173	87.4021	88.0172	87.0581	87.5192	93.0969	93.9376	92.6201	93.2182
53	99.3292	100.443	98.7052	99.4924	88.0928	88.5732	87.5990	88.0883	93.7110	94.5080	93.1521	93.7904
54	99.8613	100.979	99.2333	100.025	88.7562	89.2416	88.3207	88.7728	94.3088	95.1104	93.7770	94.3987
55	99.7957	100.972	99.2458	100.004	88.7645	89.2901	88.3914	88.8154	94.2801	95.1309	93.8186	94.4099
56	98.9275	100.170	98.4724	99.1901	87.9665	88.5460	87.6518	88.0548	93.4470	94.3582	93.0621	93.6224
57	99.3116	100.681	98.9913	99.6612	88.3089	89.0235	88.1803	88.5309	93.8503	94.8521	93.5858	94.0961
58	100.647	102.087	100.324	101.015	89.3842	89.9982	89.1256	89.5027	95.0158	96.0425	94.7247	95.2610
59	100.338	101.670	99.8995	100.636	89.1493	89.7120	88.7852	89.2155	94.7436	95.6911	94.3424	94.9257
60	100.857	102.256	100.499	101.204	89.5771	90.1684	89.2851	89.6749	95.2170	96.2120	94.8919	95.4601
61	101.378	102.657	101.109	101.701	89.9211	90.5651	89.7310	90.0724	95.6496	96.7110	95.4201	95.9269
62	101.583	103.126	101.411	102.040	90.2018	90.3674	90.0773	90.3822	95.8322	96.9967	95.7440	96.2110
63	102.359	104.068	102.354	102.927	91.0411	91.7826	91.0923	91.3053	96.7002	97.7252	96.7232	97.1162
64	102.173	103.870	102.242	102.762	91.2101	92.0761	91.5227	91.6029	96.6914	97.7731	96.6824	97.1823
65	101.333	103.028	101.460	101.940	90.4804	91.4020	90.8501	90.9108	95.9069	97.2149	96.1551	96.4256
66	100.855	102.496	100.930	101.425	89.9423	90.5420	90.2599	90.3481	95.4807	96.6692	95.5951	95.8884
67	100.836	102.399	100.809	101.348	89.8530	90.7039	90.0865	90.2145	95.3646	96.6514	95.4478	95.7812
68	100.850	102.342	100.726	101.306	89.8415	90.6426	89.9855	90.1567	95.3459	96.4925	95.3560	95.7315
69	101.406	102.963	101.345	101.905	90.3608	91.1832	90.5469	90.6970	95.8836	97.0730	95.9459	96.3008
70	102.042	103.569	101.885	102.495	90.8261	91.5906	90.9158	91.1122	96.4343	97.5797	95.9859	96.0055
71	102.776	104.056	102.194	103.209	91.2945	91.3366	90.9914	91.3742	97.0364	97.9462	96.5926	97.1914
72	102.726	103.990	102.122	102.946	91.2539	91.7883	90.9398	91.3273	96.9902	97.8890	96.5310	97.1167
73	102.715	103.803	101.826	102.781	91.1522	91.5476	90.5838	91.0945	96.9334	97.4754	96.2047	96.9378
74	101.605	102.837	100.995	101.812	90.1462	90.6938	89.6343	90.2248	95.8756	96.7654	95.4144	96.0185
75	101.976	103.227	101.365	102.189	90.5855	91.1299	90.2674	90.6609	96.2805	97.1785	95.8162	96.4250
76	102.341	103.605	101.733	102.560	91.0265	91.5674	90.7073	91.1004	96.6838	97.5860	96.2203	96.8300
77	102.019	103.252	101.391	102.221	90.7573	91.2935	90.4172	90.8228	96.3673	97.2731	95.9043	96.5218
78	101.472	102.663	100.831	101.655	90.2260	90.7614	89.8725	90.2866	95.8489	96.7124	95.3519	95.9710
79	101.430	102.624	100.790	101.614	90.0981	90.6338	89.7586	90.1635	95.7638	96.6289	95.2741	95.8890
80	102.594	102.726	101.974	102.765	90.6465	91.1583	90.3117	90.7855	96.6201	97.4424	95.1427	96.7350
81	102.635	103.746	102.006	102.795	90.8633	91.4021	90.4945	90.9200	96.7492	97.5738	96.2501	96.8577
82	102.507	103.672	106.760	102.646	97.3885	98.0520	96.4670	97.3025	102.448	103.362	101.613	102.474
83	108.287	108.529	107.185	108.134	98.3530	98.8805	96.7965	98.0767	103.320	104.205	102.091	103.205
84	108.406	109.687	107.062	105.385	98.5027	98.9499	95.1756	98.1094	103.455	104.318	101.969	103.247
85	108.567	109.886	107.072	108.508	98.7671	99.1664	96.9627	98.2987	103.667	104.526	102.017	103.403
86	108.857	110.204	107.261	108.774	99.1354	99.5036	97.2141	98.6177	103.996	104.854	102.237	103.696
87	109.539	110.968	107.782	109.430	100.014	100.349	97.8991	99.4207	104.776	105.658	102.841	104.425
88	109.303	110.713	107.341	109.119	99.9101	100.191	97.5194	99.2069	104.607	105.452	102.430	104.163
89	109.262	110.687	107.119	109.023	99.9849	100.214	97.5846	99.1944	104.623	105.450	102.252	104.108
90	109.473	110.907	107.245	109.210	100.255	100.462	97.5582	99.4252	104.864	105.685	102.404	104.318
91	110.179	111.609	107.930	109.906	101.710	102.042	98.7152	100.832	105.945	106.831	103.333	105.369
92	109.123	110.421	107.977	106.955	100.512	101.042	98.1422	99.8987	104.817	105.731	102.731	104.427
93	109.706	111.007	107.977	109.563	101.359	101.988	99.0139	99.9187	105.532	106.497	103.495	105.175
94	110.442	111.738	108.621	110.267	101.208	102.659	97.7086	100.767	106.325	107.299	104.165	105.929
95	109.951	111.212	108.112	109.758	101.576	102.202	99.0633	100.947	105.763	106.707	103.588	105.353
96	112.425	111.575	110.586	112.195	102.637	103.189	100.107	101.978	107.531	108.382	105.346	107.237
97	112.321	113.484	110.455	112.087	102.763	103.339	100.190	102.097	107.542	108.411	105.322	107.092
98	111.864	113.052	105.971	111.629	102.597	103.200	99.3671	101.922	107.231	108.126	104.969	106.775

1934
1935
1936
1937

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
1938												
99	113.602	114.737	111.438	113.259	104.237	104.964	101.332	103.511	108.920	109.850	106.385	108.385
100	114.515	115.554	112.170	114.021	104.527	105.526	101.621	103.912	109.553	110.540	106.895	108.996
101	116.453	117.274	112.762	115.830	106.644	107.643	103.283	105.857	111.549	112.458	108.523	110.843
102	118.958	119.314	115.393	117.888	108.255	109.002	104.122	107.128	113.109	114.158	109.758	112.508
103	119.872	120.173	116.122	118.722	108.964	109.757	104.693	107.805	114.418	114.965	110.408	113.264
104	121.416	121.534	117.343	120.098	110.746	110.933	105.655	108.958	115.831	116.234	111.519	114.528
105	122.592	122.907	118.461	121.320	111.630	112.393	106.971	110.331	117.111	116.650	112.716	115.826
106	123.769	123.977	119.297	122.348	112.710	113.279	107.692	111.227	118.239	117.650	113.494	116.787
107	124.527	124.777	120.022	123.108	113.675	114.188	108.588	112.150	119.101	119.628	114.305	117.629
108	126.197	125.197	120.426	123.485	114.056	114.624	109.047	112.576	119.449	119.483	114.717	118.032
1939												
109	125.290	125.703	120.661	123.865	114.453	115.032	109.229	112.905	119.872	120.368	114.945	116.395
110	123.992	124.203	115.975	122.723	113.030	113.703	108.491	111.741	118.511	118.955	114.233	117.232
111	123.219	123.367	119.692	122.093	112.184	113.017	108.189	111.130	117.702	118.192	113.940	116.611
112	122.835	122.934	115.621	121.758	111.707	112.643	108.060	110.805	117.273	117.789	113.841	116.301
113	122.067	122.098	119.176	121.113	110.907	111.950	107.633	110.163	116.487	117.024	113.606	115.638
114	123.944	123.483	120.183	122.537	112.201	112.830	108.142	111.058	118.073	118.157	114.162	116.157
115	128.119	126.989	123.020	126.110	114.592	114.926	109.304	112.941	121.456	120.958	116.162	119.525
116	136.795	133.634	126.176	132.865	120.665	119.338	112.354	117.454	128.734	126.486	120.265	125.162

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
EGYPT	0.554544	0.487267	0.376320	0.472710	0.978983	1.04120	0.934951	0.985603	0.766763	0.764231	0.655635	0.728877
S.AFRICA	0.768335	1.48255	1.94440	1.39843	1.21345	1.89850	1.82315	1.57838	0.790911	1.59055	1.88378	1.48840
CANADA	17.8116	17.4524	18.2332	17.8324	5.26451	4.56605	4.52391	4.91816	11.5380	11.0092	11.5786	11.3753
BRAZIL	4.51889	4.30415	4.58910	4.47073	1.6773C	1.76066	1.91864	1.85220	3.19810	3.03243	3.25387	3.16146
ARGENTINA	3.53877	3.32981	3.10452	3.32437	3.75787	2.97056	2.79293	3.17579	3.66832	3.1501B	2.94872	3.24908
INDIA	3.39227	3.29128	3.33346	3.33567	4.59511	4.06417	3.99898	4.21942	3.99369	3.67772	3.66122	3.77755
JAPAN	9.14567	10.1243	9.13378	9.46758	4.10718	4.03880	3.45768	3.88289	6.62593	7.10404	6.29573	6.67523
CHINA	3.80947	2.83839	2.10359	2.91715	2.62463	1.71748	1.55620	1.79944	2.21705	2.27794	1.57990	2.35830
AUSTRIA	1.04958	1.22024	2.21800	1.49594	1.61061	1.74676	1.61582	1.65706	1.33009	1.48250	1.91691	1.57650
RUSSIA	0.247705	0.146862	0.162479	0.185682	1.24593	1.03879	1.10936	1.15136	0.746816	0.593828	0.635919	0.658521
BELGIUM-LUX	2.65965	2.86462	3.08163	2.86864	3.65200	4.30740	5.62344	4.32762	3.59328	3.58601	4.05254	3.59813
CZECHOSLOVAKIA	0.621413	0.741126	1.40815	0.923565	2.13114	1.76290	1.73783	1.87729	1.37628	1.25201	1.57299	1.40043
FRANCE	5.44763	5.42188	5.34807	5.40586	10.1552	11.2436	9.11448	10.1711	7.80140	8.33272	7.23128	7.78847
GERMANY	8.67149	4.86170	4.25039	5.92786	11.7361	11.0487	11.0494	10.9902	10.2038	7.52643	7.64990	8.45937
ITALY	3.38192	3.10899	2.55987	3.01693	3.49288	3.06656	2.74443	3.09798	3.43740	3.08778	2.64715	3.05744
NETHERLANDS	4.59890	4.43742	5.91498	4.98377	5.38012	5.51631	5.90206	5.59950	4.98951	4.97687	5.90852	5.29163
SWEDEN	1.35220	2.28532	2.61643	2.15132	1.81140	2.49423	3.11107	2.47223	1.58180	2.38977	2.96375	2.31178
SWITZERLAND	0.800926	0.713710	1.00615	0.840263	1.63396	2.04342	2.29728	2.07222	1.23599	1.23859	1.54998	1.44406
DENMARK	0.596017	0.433768	0.635801	0.555156	1.87596	2.21580	2.03581	1.02356	0.653921	0.727373	1.46654	1.31371
FINLAND	0.367007	0.535282	0.855116	0.585802	0.940835	0.919464	1.29979	1.24139	0.740004	0.727656	1.03245	0.804583
NORWAY	0.574765	0.901770	1.00628	0.827604	0.905243	1.25135	1.56757	1.30239	0.770613	1.06730	1.28692	1.03550
POLAND	0.234098	0.967717	0.943598	0.715138	1.30713	1.16689	1.43116	1.34658	1.66642	1.60057	1.18838	1.00876
SPAIN	1.51302	1.70069	0.547318	1.25368	1.81982	1.50045	1.04110	1.34668	1.66642	0.613294	0.632985	1.29998
IRELAND	0.180298	0.214143	0.573122	0.322521	1.0665C	1.01244	1.31987	1.04668	0.635401	0.807109	0.807109	0.684601
AUSTRALIA	2.80025	1.96018	1.68504	1.50845	2.82848	2.95182	1.49359	3.03672	2.45437	2.46100	2.50246	2.47261
NEW ZEALAND	0.704984	0.732875	0.664280	0.700747	1.02875	1.12291	1.17934	1.25369	0.866266	0.957944	1.07694	0.967916
U.K.	18.1638	20.3887	18.6015	19.0514	20.2146	20.1925	21.1934	20.9056	19.1892	20.5538	20.1925	19.0785
MEXICO	3.21581	3.65268	2.91331	3.06060	0.524335	1.74243	0.737472	1.00808	1.67008	2.40755	1.82539	2.0436

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
1930 1	99.5219	99.5337	99.5054	99.5203	99.7078	99.6418	99.5816	99.6438	99.6149	99.5878	99.5435	99.5820
2	100.048	100.035	99.9947	100.026	100.645	100.499	100.359	100.501	100.347	100.267	100.177	100.264
3	100.580	100.600	100.570	100.583	101.127	100.956	100.830	100.971	100.853	100.778	100.700	100.777
4	100.747	100.823	100.814	100.795	101.160	101.039	100.904	101.034	100.954	100.931	100.859	100.915
5	100.756	100.823	100.805	100.795	101.419	101.209	101.017	101.215	101.088	101.016	100.911	101.005
6	101.168	101.168	101.124	101.144	101.381	101.959	101.593	101.978	101.760	101.563	101.358	101.561
7	101.140	101.223	101.175	101.202	102.550	102.102	101.727	102.126	101.880	101.662	101.451	101.664
8	101.209	101.200	101.140	101.176	102.610	102.179	101.809	102.199	101.899	101.690	101.474	101.688
9	101.281	101.302	101.247	101.280	102.741	102.333	101.965	102.346	102.011	101.822	101.606	101.813
10	101.333	101.368	101.302	101.334	102.976	102.524	102.111	102.537	102.155	101.946	101.798	101.936
11	101.387	101.438	101.387	101.404	103.027	102.595	102.210	102.611	102.207	102.017	101.707	102.007
12	101.301	101.340	101.261	101.301	103.359	102.814	102.317	102.830	102.330	102.077	101.789	102.065
1931 13	101.590	101.741	101.702	101.678	104.584	103.842	103.276	103.901	103.087	102.792	102.489	102.789
14	102.003	102.298	102.311	102.204	105.498	104.664	104.043	104.735	103.751	103.177	103.177	103.470
15	101.785	102.138	102.176	102.033	104.756	104.121	103.702	104.193	103.271	103.130	103.113	103.515
16	101.862	102.202	102.221	102.095	105.230	104.520	104.055	104.602	103.546	103.361	103.138	103.348
17	102.036	102.335	102.320	102.230	106.050	105.170	104.610	105.277	104.043	103.753	103.465	103.753
18	101.806	102.092	102.084	101.994	105.670	104.766	104.199	104.878	103.738	103.465	103.436	103.436
19	101.819	102.091	102.078	101.996	105.937	105.021	104.446	105.134	103.878	103.556	103.565	103.565
20	102.025	102.290	102.226	102.180	106.781	105.719	105.052	105.851	104.403	103.639	104.015	104.015
21	100.400	101.296	101.140	100.945	106.837	103.956	103.572	104.122	104.403	104.004	104.015	104.015
22	97.9969	100.481	100.227	99.5681	103.284	102.810	102.694	102.929	102.619	102.626	102.534	102.534
23	99.1960	102.276	101.985	101.149	104.001	104.029	104.144	104.058	101.594	101.153	101.249	102.604
24	95.7254	99.5388	99.1213	100.545	100.212	100.990	100.749	98.135	100.125	100.056	99.4387	99.4387
1932 25	98.5083	102.054	101.696	104.591	104.591	104.830	104.705	101.550	103.372	103.265	102.729	102.729
26	100.778	104.303	103.933	103.005	106.992	107.185	107.136	103.885	105.744	105.535	105.055	105.055
27	101.761	104.715	104.387	103.621	108.298	108.467	108.055	105.030	106.591	106.223	105.948	105.948
28	101.018	103.640	103.381	102.680	107.374	107.510	106.999	104.275	105.575	105.190	104.987	104.987
29	100.120	102.894	102.634	101.883	106.235	106.558	106.016	103.294	104.726	104.325	104.076	104.076
30	98.7268	101.501	101.254	100.494	105.098	104.935	105.223	103.178	103.569	102.859	102.859	102.859
31	100.395	103.394	103.139	102.309	107.388	107.266	106.270	103.892	104.917	104.917	104.917	104.917
32	102.145	105.299	105.057	104.167	110.271	109.653	109.868	105.912	107.785	107.355	107.017	107.017
33	105.427	108.674	108.426	107.509	113.251	113.253	113.642	109.339	111.247	110.840	110.475	110.475
34	107.478	111.010	110.754	109.751	115.515	115.573	115.717	111.502	113.163	112.734	112.734	112.734
35	104.468	107.214	107.934	106.872	112.004	112.525	112.213	108.236	110.370	109.543	109.543	109.543
36	103.815	107.498	107.185	106.166	112.101	111.853	112.148	108.211	110.022	105.995	105.519	105.519
1933 37	104.087	107.884	107.560	106.510	112.335	112.983	112.576	108.211	110.433	109.985	109.563	109.157
38	98.7737	102.115	101.899	100.929	106.788	106.555	106.948	102.097	104.835	104.423	104.013	102.292
39	98.4238	101.757	101.541	100.574	106.122	106.904	106.344	102.273	104.330	103.942	103.515	103.515
40	97.9224	100.995	100.827	99.9147	104.352	105.091	104.565	101.137	103.043	102.696	102.292	102.292
41	96.8030	99.2227	99.1642	98.4133	100.190	100.398	99.5854	98.4963	99.3748	99.3752	99.2555	99.2555
42	96.8666	99.0658	98.9984	98.3103	98.4188	97.7008	97.8142	97.6627	98.9833	98.4063	98.3108	98.3108
43	96.3459	97.9383	97.9697	97.4180	93.3427	93.5420	92.5936	94.8443	95.7402	95.2816	95.2887	95.2887
44	97.4928	99.2867	99.3021	98.6939	95.2976	95.5288	94.5485	95.3594	96.3952	96.9253	96.9394	96.9394
45	98.5046	100.179	100.243	99.6422	94.7800	94.0382	93.0753	96.1423	97.1087	96.6591	96.6367	96.6367
46	98.7880	100.497	100.562	99.9493	94.3261	93.5740	93.6564	96.5570	97.5357	97.5357	97.1094	97.0674

		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
	47	98.5928	99.6999	99.8358	99.3762	91.1711	91.3752	90.3590	90.9684	94.8820	95.5375	95.0974	95.1723
	48	98.4538	99.4165	99.5050	99.1251	92.3092	92.4267	91.4205	92.0521	95.3815	95.9216	95.4627	95.5886
	49	98.0379	99.0800	99.1461	98.7547	92.4909	92.4178	91.3943	92.1010	95.2644	95.7489	95.2702	95.4278
	50	97.5202	98.7165	98.8013	98.3460	91.2242	91.2290	90.2316	90.8950	94.3722	94.9727	94.5165	94.6205
	51	97.7932	98.8723	98.9629	98.5428	91.5078	91.3629	90.3383	91.0697	94.6505	95.1176	94.6506	94.8062
	52	97.8303	98.7967	98.8959	98.5076	91.4926	91.2809	90.2024	90.9920	94.6614	95.0388	94.5492	94.7498
	53	98.2598	99.2792	99.3545	98.9645	92.4024	92.0736	90.9769	91.8176	95.3311	95.6764	95.1657	95.3911
1934	54	99.4078	100.612	100.685	100.235	93.5397	93.2745	92.2633	93.0258	96.4738	96.9431	96.4743	96.6304
	55	99.5957	100.759	100.847	100.401	93.6212	93.4042	92.3865	93.1373	96.6085	97.0818	96.6170	96.7691
	56	100.334	101.565	101.666	101.188	93.5140	93.4269	92.4333	93.1247	96.9240	97.4957	97.0497	97.1564
	57	101.288	102.687	102.768	102.248	94.4029	94.3666	93.4155	94.0617	97.8453	98.5268	98.0919	98.1547
	58	101.038	102.486	102.556	102.026	94.5930	94.5611	93.5921	94.2487	97.8156	98.5234	98.0738	98.1376
	59	101.166	102.487	102.557	102.070	94.9571	94.8313	93.7868	94.5251	98.0613	98.6593	98.1719	98.2975
	60	100.358	101.743	101.799	101.300	94.4232	94.3067	93.3074	94.0124	97.3904	98.0249	97.5530	97.6561
	61	99.6296	101.115	101.157	100.634	93.9956	93.9321	93.0276	93.6518	96.8126	97.5236	97.0923	97.1429
	62	99.3960	100.921	100.966	100.428	93.6151	93.6341	92.7755	93.3416	96.5055	97.2777	96.8706	96.8846
	63	99.2660	101.030	101.039	100.445	93.9343	94.0304	93.3145	93.7597	96.6002	97.5302	97.1767	97.1023
	64	99.6791	101.214	101.232	100.708	94.7007	94.9475	94.3609	94.6697	97.1899	98.0807	97.7965	97.6890
1935	65	99.6624	101.125	101.145	100.644	94.6724	94.9215	94.3630	94.6523	97.1674	98.0232	97.7538	97.6481
	66	99.3293	100.713	100.739	100.260	94.2397	94.4619	93.8769	94.1928	96.7845	97.5875	97.3078	97.2266
	67	99.1607	100.499	100.528	100.062	94.1310	94.3055	93.6817	94.0394	96.6458	97.4021	97.1046	97.0509
	68	99.0561	100.362	100.388	99.9354	94.1264	94.2589	93.6054	93.9969	96.5913	97.3104	96.9968	96.9662
	69	98.7773	100.145	100.171	99.6980	93.8353	94.0045	93.3939	93.7446	96.3063	97.0749	96.7826	96.7213
	70	98.3515	99.7380	99.7643	99.2846	93.5992	93.7447	93.0826	93.4755	95.9754	96.7414	96.4234	96.3801
	71	98.8066	100.133	100.145	99.6951	94.5350	94.4216	93.5727	94.1765	96.6708	97.2774	96.8591	96.9358
	72	98.9907	100.221	100.234	99.7852	94.6023	94.4904	93.6352	94.2427	96.7515	97.3555	96.9348	97.0139
	73	99.5466	100.819	100.834	100.400	95.1466	95.0221	94.1456	94.7714	97.3466	97.9206	97.4896	97.5856
	74	99.3655	100.581	100.611	100.186	94.5703	94.4471	93.5675	94.1950	96.9679	97.5139	97.0890	97.1903
	75	99.3467	100.598	100.622	100.189	94.7711	94.6672	93.7834	94.4072	97.0589	97.6326	97.2026	97.2980
	76	99.2389	100.524	100.541	100.101	94.8489	94.7499	93.8718	94.4902	97.0439	97.6367	97.2066	97.2957
	77	99.3545	100.597	100.617	100.189	94.9134	94.8043	93.9220	94.5466	97.1340	97.7007	97.2693	97.3680
1936	78	98.9200	100.067	100.095	99.6940	94.3444	94.2213	93.3213	93.9623	96.6322	97.1440	96.7083	96.8282
	79	99.0653	100.202	100.233	99.8335	94.4282	94.2918	93.3851	94.0350	96.7467	97.2471	96.8090	96.9343
	80	99.1017	100.236	100.227	99.8715	94.4345	94.3126	93.4186	94.0552	96.7681	97.2744	96.8476	96.9634
	81	99.0608	100.156	100.200	99.8055	94.3708	94.2776	93.3581	94.0022	96.7158	97.2169	96.7788	96.9038
	82	101.281	102.137	102.081	101.833	100.098	100.320	98.8560	99.7579	100.689	101.228	100.468	100.795
	83	101.534	102.388	102.328	102.083	100.679	100.895	99.3520	100.309	101.106	101.641	100.840	101.196
	84	101.231	102.087	102.035	101.784	100.035	100.270	98.7155	99.6736	100.633	101.178	100.376	100.729
	85	101.102	101.953	101.895	101.650	99.8896	100.117	98.5060	99.5042	100.496	101.035	100.200	100.577
	86	101.245	102.113	102.039	101.799	100.193	100.401	98.7340	99.7760	100.719	101.257	100.387	100.787
	87	101.431	102.305	102.211	101.982	100.631	100.852	99.0789	100.188	101.031	101.579	100.645	101.085
	88	101.324	102.094	101.981	101.799	100.638	100.848	98.9267	100.137	100.981	101.471	100.454	100.968
	89	101.226	101.961	101.844	101.677	100.659	100.832	98.8212	100.104	100.942	101.396	100.333	100.890
1937	90	101.125	101.840	101.697	101.554	100.889	101.040	98.8661	100.265	101.007	101.440	100.282	100.909
	91	101.152	101.703	101.518	101.458	102.289	102.554	99.9244	101.589	101.720	102.128	100.721	101.523
	92	101.215	101.733	101.514	101.487	102.444	102.642	99.8782	101.655	101.830	102.188	100.696	101.571
	93	101.586	102.120	101.885	101.864	103.578	103.896	101.004	102.826	102.582	103.008	101.445	102.345
	94	101.744	102.270	102.008	102.007	104.387	104.703	101.714	103.601	103.065	103.487	101.861	102.804
	95	101.536	101.989	101.728	101.751	104.161	104.434	101.422	103.339	102.848	103.212	101.575	102.545
	96	101.472	101.922	101.649	101.681	104.364	104.609	101.589	103.521	102.918	103.266	101.619	102.601
	97	101.528	101.942	101.663	101.711	104.617	104.898	101.769	103.761	103.072	103.420	101.716	102.736
	98	101.551	101.883	101.597	101.677	104.837	105.032	101.851	103.906	103.194	103.458	101.724	102.792

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
99	101.803	102.122	101.784	101.903	106.245	106.599	102.989	105.279	104.026	104.360	102.387	103.591
100	101.667	101.997	101.645	101.770	106.399	106.906	103.057	105.454	104.033	104.451	102.351	103.612
101	101.890	102.155	101.780	101.943	107.977	108.580	104.105	106.954	104.933	105.370	103.043	104.449
102	102.151	102.389	101.967	102.169	109.327	109.662	104.865	107.951	105.739	106.026	103.416	105.060
103	102.960	103.245	102.805	103.003	110.357	110.722	105.758	108.946	106.659	106.984	104.282	105.975
104	103.633	104.164	103.699	103.899	112.084	112.396	107.183	110.554	107.959	108.280	105.441	107.226
105	104.165	104.626	104.109	104.300	112.883	113.276	107.969	111.376	108.524	108.951	106.039	107.838
106	104.284	104.788	104.238	104.437	113.567	113.743	108.272	111.861	108.926	109.266	106.255	108.149
107	105.048	105.639	105.070	105.252	114.735	114.801	109.352	112.963	109.891	110.220	107.211	109.107
108	105.172	105.832	105.241	105.415	115.063	115.168	109.707	113.313	110.118	110.500	107.474	109.364
109	105.372	106.030	105.410	105.604	115.474	115.623	109.985	113.694	110.423	110.827	107.697	109.649
110	105.350	106.013	105.521	105.628	114.395	114.610	109.563	112.856	109.873	110.312	107.542	109.242
111	105.282	105.978	105.562	105.608	113.648	114.017	109.337	112.334	109.465	109.997	107.450	108.971
112	105.134	105.866	105.498	105.499	113.127	113.580	109.127	111.945	109.131	109.723	107.312	108.722
113	105.168	105.935	105.601	105.568	112.878	113.377	109.090	111.781	109.023	109.656	107.345	108.675
114	105.839	106.556	106.177	106.191	114.857	114.865	110.247	113.323	110.348	110.710	108.212	109.757
115	106.712	107.361	106.919	106.997	117.435	117.144	111.540	115.373	112.074	112.253	109.230	111.185
116	106.847	109.399	108.811	109.019	124.114	122.164	115.038	120.439	116.681	115.781	111.924	114.729

(1938 spans rows 101–108; 1939 spans rows 113–116)

Country	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
EGYPT	0.918695	0.968992	0.792393	0.853360	0.877560	0.956978	0.862296	0.898945	0.484715	0.526939	0.470768	0.494140
S.AFRICA	0.415801	1.40387	1.09131	0.970330	1.10098	1.57840	1.71246	1.46395	0.758392	1.49114	1.40189	1.21714
U.S.A.	55.1570	49.7778	50.8068	51.9139	14.5410	11.9717	12.3323	12.9481	34.8490	30.8748	31.5695	32.4311
BRAZIL	0.305739	0.379785	0.327996	0.337840	3.68686	1.61817	1.76036	1.68846	0.996298	0.958978	1.04418	1.01315
ARGENTINA	0.863219	0.573583	0.469424	0.642075	3.36790	2.72535	2.56275	2.88533	2.12556	2.45905	1.51609	1.76370
INDIA	1.04012	1.18116	1.13744	1.11957	4.12184	3.73693	3.65663	3.83847	2.58098	2.45905	2.39704	2.47902
JAPAN	2.04830	1.44842	1.62293	1.70655	3.70677	3.76926	3.18771	3.55458	2.87754	2.60884	2.40532	2.63056
CHINA	0.746894	0.644304	0.593802	0.661667	2.36985	1.59097	0.987065	1.64929	1.55837	1.11764	0.790433	1.15548
RUSSIA	0.918695	0.	0.621891	0.513529	1.45660	1.59973	1.48492	1.51375	0.774235	0.799867	0.773552	0.782551
AUSTRIA	0.983224	0.	0.621891	0.368371	1.28888	0.959305	1.02653	1.03824	0.588599	0.479653	0.544360	0.537537
BELGIUM-LUX	1.58657	1.12099	1.09733	1.26829	3.29035	3.96858	4.61359	3.95751	2.43846	2.54478	2.85546	2.61290
CZECHOSLOVAKIA	0.195677	0.193798	0.424285	0.271254	1.91758	1.62216	1.59132	1.71035	1.05663	0.907979	1.00780	0.990804
FRANCE	1.76348	1.24407	1.09733	1.36829	9.14553	10.3735	8.40761	9.30888	5.45451	5.80877	4.75247	5.33858
GERMANY	2.63056	1.25188	1.84961	1.91068	10.5861	9.37123	10.1419	10.0331	6.60832	5.31155	5.99577	5.97188
ITALY	1.07321	0.405963	0.362096	0.613757	3.16641	2.83638	2.52534	2.84271	2.11981	1.62117	1.44372	1.72823
NETHERLANDS	2.45216	1.71789	1.08028	1.58344	4.84933	5.09114	5.43842	5.12629	3.65075	3.15451	3.25935	3.35487
SWEDEN	0.308126	0.335241	0.469424	0.370930	1.63255	2.29975	2.86797	2.26676	0.970339	1.31749	1.66870	1.31884
SWITZERLAND	0.377937	0.361419	0.299907	0.366421	1.65693	2.04893	1.92877	1.87821	1.01744	1.20518	1.11434	1.11232
DENMARK	0.206706	0.707214	0.124378	0.139935	1.68917	1.88248	2.11287	1.89484	0.947937	0.976602	1.11862	1.01439
FINLAND	0.918695	0.707214	0.621891	0.749267	0.842286	0.845497	1.11097	0.935585	0.468078	0.459109	0.585581	0.504256
NORWAY	0.303351	0.450506	0.576752	0.443536	0.820280	1.15567	1.45067	1.14221	0.561815	0.803089	1.01371	0.792871
POLAND	0.229674	0.707214	0.621891	0.519593	1.18230	1.07366	1.31861	1.19152	0.602632	0.572191	0.690398	0.621741
SPAIN	0.310514	0.238342	0.792393	0.209365	1.64628	1.38663	0.664791	1.23257	0.978398	0.812485	0.372015	0.720966
IRELAND	0.160772	0.212164	0.248756	0.207231	0.981851	0.937527	0.964924	0.961434	0.571311	0.574846	0.606840	0.584332
AUSTRALIA	0.820572	2.30489	2.76539	1.96362	2.55084	2.72401	3.05001	2.77495	1.68570	2.51645	2.90770	2.36929
NEW ZEALAND	0.979864	0.927190	1.45341	1.12015	0.922701	1.08736	1.37087	1.12698	0.951283	1.00728	1.41214	1.12357
U.K.	25.7209	33.7793	31.4905	30.3303	18.2824	19.1484	20.1918	19.2075	22.0017	26.4639	25.8412	24.7689
MEXICO	0.165547	0.238342	0.203617	0.202502	0.476862	1.64031	0.676514	0.931230	0.321204	0.939328	0.440066	0.566866

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12
47	131.220	124.030	125.427	126.892	146.682	147.431	145.397	146.570	139.051	135.730	135.412	136.731
48	130.714	123.515	124.866	126.365	145.319	145.689	143.666	144.892	138.017	134.602	134.266	135.628
49	132.171	124.725	126.174	127.690	147.710	148.144	146.140	147.331	139.940	136.435	136.157	137.511
50	136.865	128.429	130.155	131.816	154.408	154.679	152.557	153.882	145.637	141.554	141.356	142.849
51	137.730	129.144	130.941	132.605	155.794	155.995	153.829	155.206	146.762	142.569	142.385	143.905
52	137.801	129.138	130.916	132.619	155.768	155.978	153.628	155.092	146.785	142.508	142.272	143.855
53	138.754	129.766	131.558	133.359	156.926	156.948	154.636	156.170	147.840	143.357	143.097	144.765
1934 54	135.081	130.090	131.877	133.683	157.450	157.542	155.335	156.776	148.266	143.816	143.606	145.229
55	139.606	130.524	132.418	134.183	157.904	158.034	155.922	157.287	148.755	144.279	144.170	145.735
56	135.129	130.252	132.169	133.850	157.683	157.948	155.853	157.161	148.406	144.100	144.011	145.506
57	139.674	130.724	132.715	134.371	158.606	159.004	156.941	158.184	149.140	144.864	144.828	146.277
58	135.951	130.937	132.912	134.600	159.164	159.600	157.469	158.744	149.557	145.269	145.190	146.672
59	139.238	130.278	132.187	133.901	157.820	158.098	155.907	157.275	148.529	144.188	144.047	145.588
60	135.992	130.912	132.877	134.594	158.918	159.251	157.106	158.625	149.455	145.082	144.991	146.509
61	140.103	131.104	133.089	134.765	159.268	159.717	157.632	158.872	149.685	145.410	145.360	146.819
62	140.318	131.351	133.357	135.009	159.674	160.223	158.206	159.368	149.996	145.787	145.782	147.188
63	141.730	132.553	134.646	136.310	161.818	162.537	160.601	161.652	151.774	147.545	147.623	148.981
64	145.493	135.656	138.184	139.778	161.570	162.508	160.816	161.631	153.531	149.082	149.500	150.705
1935 65	144.838	135.188	137.715	139.247	160.513	161.455	159.829	160.599	152.676	148.322	148.772	149.923
66	144.699	135.039	137.580	139.106	160.227	161.108	159.463	160.266	152.463	148.073	148.521	149.686
67	144.899	135.139	137.660	139.233	160.371	161.181	159.482	160.345	152.635	148.160	148.571	149.789
68	145.025	135.170	137.666	139.287	160.416	161.140	159.390	160.316	152.721	148.155	148.528	149.801
69	144.816	135.064	137.533	139.138	160.388	161.168	159.449	160.335	152.602	148.116	148.491	149.736
70	145.054	135.191	137.623	139.289	160.799	161.550	159.755	160.701	152.926	148.370	148.689	149.995
71	145.702	135.369	137.695	139.589	161.520	161.925	159.862	161.102	153.611	148.647	148.778	150.345
72	146.025	135.623	137.953	139.867	161.832	162.226	150.157	161.405	153.928	148.924	149.055	150.636
73	146.262	135.660	137.967	139.963	161.972	162.225	160.038	161.412	154.117	148.943	149.002	150.687
74	146.109	135.682	138.038	135.943	161.940	162.292	160.206	161.479	154.024	148.987	149.122	150.711
75	145.777	135.423	137.735	139.645	161.498	161.879	159.786	161.054	153.637	148.651	149.761	150.350
76	145.529	135.236	137.515	139.427	161.171	161.569	159.496	160.745	153.350	148.403	148.505	150.086
1936 77	145.145	134.929	137.181	139.085	160.595	160.966	158.880	160.147	152.870	147.947	148.030	149.616
78	144.747	134.616	136.850	138.738	159.927	160.250	158.165	159.448	152.337	147.433	147.508	149.093
79	145.317	135.046	137.322	139.229	160.681	160.976	158.867	160.175	152.999	148.011	148.095	149.702
80	144.835	134.671	136.929	138.812	155.929	160.246	158.186	159.454	152.382	147.459	147.557	149.133
81	143.070	133.340	135.452	137.287	157.404	157.896	155.915	157.072	150.237	145.684	145.684	147.180
82	113.550	109.576	109.805	110.977	119.467	120.044	117.852	119.121	116.509	114.810	113.828	115.049
83	113.309	109.384	109.561	110.751	119.131	119.726	117.522	118.793	116.220	114.555	113.542	114.772
84	113.787	105.412	109.569	110.756	115.220	119.826	117.623	118.890	116.254	114.619	113.596	114.823
85	112.903	109.083	109.185	110.390	118.740	119.338	117.120	118.399	115.821	114.210	113.153	114.395
86	112.789	108.990	109.084	110.288	118.615	119.220	117.002	118.279	115.702	114.105	113.043	114.283
87	111.699	108.096	108.150	109.315	117.211	117.839	115.626	116.892	114.455	112.967	111.888	113.103
88	109.420	106.216	106.174	107.270	114.362	114.974	112.752	114.029	111.891	110.595	109.463	110.650
89	108.756	105.679	105.609	106.682	113.554	114.152	111.923	113.210	111.155	109.915	108.766	109.946
1937 90	108.234	105.247	105.139	106.207	112.842	113.455	111.220	112.505	110.538	109.351	108.179	109.356
91	95.6995	94.8624	94.2840	94.9487	97.2001	97.8150	95.5799	96.8650	96.4498	96.3387	94.9320	95.9068
92	94.3798	93.6979	93.1284	93.7354	95.5886	96.1731	93.9573	95.2397	94.9842	94.9355	93.5429	94.4875
93	90.0118	90.0511	89.3548	89.8059	90.1263	90.7707	98.5480	89.8150	90.0690	90.4109	88.7514	89.8104
94	86.9960	87.5158	86.7207	87.0775	86.3598	86.9660	84.7807	86.0355	86.6779	87.2409	85.7507	86.5565
95	87.5438	87.9585	87.1799	87.5607	87.0564	87.6299	85.4289	56.7051	97.3001	87.7942	86.3044	87.1329
96	88.5966	88.7588	87.9830	88.4461	88.1001	89.5949	96.4572	87.7174	99.3484	88.6768	87.2201	89.0818
97	86.7669	87.2611	86.5030	86.8503	85.9241	86.4913	84.3115	85.5756	86.3455	86.8862	85.4073	86.2130
98	85.6910	86.3554	85.5430	85.8631	84.6313	85.1494	82.9548	84.2452	85.1611	85.7524	84.2489	85.0541

- 435 -

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12
99	83.0297	84.0881	83.1852	83.4343	81.2625	81.8289	79.5452	80.8789	82.1461	82.9585	81.3652	82.1566
100	82.8130	83.8582	82.9329	83.2013	80.9453	81.5657	79.1767	80.5626	81.3791	82.7119	81.0548	81.8820
101	77.7955	79.5718	75.4256	78.5976	74.6945	75.2775	72.2735	74.2552	76.2450	77.4247	75.6096	76.4264
102	77.6994	79.1805	77.9552	78.2810	74.5833	74.3518	72.2106	73.9152	76.1413	77.0701	75.0829	76.0981
103	77.6566	79.1140	77.8692	78.2133	74.5495	74.9314	72.1334	73.3714	76.1031	77.0227	75.0013	76.0424
104	77.5451	78.8831	77.6003	78.0095	74.3728	74.6879	71.7621	73.6143	75.9590	76.7855	74.6912	75.8119
105	77.0351	78.5275	77.2439	77.6022	73.8576	74.2671	71.4066	73.1771	75.4464	76.3973	74.3253	75.3896
106	76.8429	78.7612	76.9475	77.3505	73.6920	74.0203	71.1028	72.9384	75.2675	76.1407	74.0252	75.1645
107	76.6419	78.0589	76.7374	77.1461	73.5114	73.8106	70.8971	72.7397	75.0766	75.9348	73.8173	74.9429
108	76.7579	78.1807	76.8803	77.2730	73.6782	74.0204	71.1323	72.9436	75.2181	76.1006	74.0063	75.1083
109	76.7992	78.2625	76.9786	77.3468	73.7662	74.1775	71.3032	73.0823	75.2827	76.2200	74.1409	75.2145
110	77.0856	78.4622	77.1789	77.5756	74.0895	74.4408	71.5585	73.3629	75.5875	76.4515	74.3687	75.4692
111	77.1364	78.5199	77.2439	77.6534	74.1377	74.5001	71.6306	73.4228	75.6371	76.5100	74.4372	75.5281
112	77.2507	78.6191	77.3542	77.7413	74.2526	74.6228	71.7633	73.5462	75.7517	76.6210	74.5587	75.6438
113	77.1639	78.5359	77.2625	77.6541	74.2267	74.5853	71.7197	73.5105	75.6953	76.5606	74.4911	75.5823
114	77.3375	78.8694	77.5346	78.1138	75.0946	75.1997	72.1051	74.1331	76.5160	77.0345	74.8199	76.1235
115	79.1482	79.3894	77.9629	78.8335	76.4578	76.3000	72.7444	75.1674	77.8030	77.8447	75.3536	77.0004
116	81.4813	80.1602	78.4707	80.0374	79.1019	77.9949	73.6039	76.9902	80.2916	79.0776	76.0373	78.4688

(1938 = rows 99–108; 1939 = rows 109–116)

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12
EGYPT	1.61039	1.15959	1.16612	1.37870	0.900929	0.986323	0.876834	0.921362	1.35566	1.07296	1.02148	1.15003
S.AFRICA	0.724859	0.765012	0.830941	0.773604	1.13100	1.64070	1.75386	1.50852	0.927928	1.20286	1.27240	1.14106
CANADA	1.34694	1.20561	1.13450	1.22902	4.85705	4.31783	4.56040	4.57843	3.10200	2.76172	2.34745	2.90372
U.S.A.	9.45684	7.38571	9.63498	8.82584	14.9269	12.3297	12.4627	13.2398	12.1919	9.85772	11.0489	11.0328
BRAZIL	1.73040	1.29841	1.51304	1.51395	1.73199	1.66773	1.67339	1.72868	1.73119	1.48307	1.64968	1.62132
ARGENTINA	3.46154	2.24432	2.47521	2.72702	3.45755	2.80495	2.60065	2.55438	3.45954	2.52463	2.53793	2.84070
INDIA	3.30141	1.96440	1.95843	2.40808	4.23175	3.35273	3.70551	3.93000	3.76658	2.90856	2.83197	3.16904
JAPAN	0.587712	0.840649	0.663352	0.697238	3.80681	3.89753	3.24094	3.64843	2.19726	2.36909	1.95215	2.17283
CHINA	2.14511	0.869506	0.676227	1.23028	2.43386	1.64973	1.00894	1.69751	2.28948	1.25962	0.842582	1.46390
RUSSIA	0.910445	1.64075	1.09113	1.21411	1.49607	1.64565	1.50779	1.54984	1.20326	1.64320	1.29946	1.29197
AUSTRIA	0.464036	0.504542	0.421908	0.463496	1.15957	0.992371	1.04521	1.06572	0.311805	0.74456	0.733557	0.764606
BELGIUM-LUX.	12.3708	10.0931	11.3563	11.2734	3.37886	4.09798	4.68350	4.05345	7.87481	7.09556	8.01989	7.66342
CZECHOSLOVAKIA	0.417827	1.20638	1.13563	0.919944	1.96903	1.67339	1.61352	1.75198	1.19343	1.43988	1.37457	1.33596
FRENCH COLONIES	15.3194	29.4217	28.2669	24.3360	1.84421	3.09575	2.38919	2.44305	8.58130	16.2587	15.3280	13.3895
GERMANY	10.9149	8.36124	7.19479	8.82365	10.8715	9.66507	10.2932	10.2766	10.8932	9.01315	8.74399	9.55011
ITALY	3.74861	3.18475	1.60677	2.84671	3.25260	2.93774	2.56929	2.51987	3.50060	3.06125	2.80803	2.88329
NETHERLANDS	4.03474	3.83282	4.43003	4.09920	4.97987	5.26416	5.52808	5.25737	4.50730	4.54848	4.97906	4.67828
SWEDEN	0.957844	1.39744	1.69350	1.34959	1.67649	2.37611	2.91578	2.32280	1.31717	1.88678	2.30464	1.83620
SWITZERLAND	4.28317	4.98377	4.67374	4.64689	1.70174	2.12171	1.96035	1.92793	3.39246	3.55274	3.31704	3.28741
DENMARK	0.403463	0.551874	0.440654	0.478664	1.73455	1.94370	2.14611	1.94145	1.06901	1.26779	1.29338	1.21006
FINLAND	0.463147	0.521703	0.595368	0.526739	0.866817	0.871749	1.12776	0.955442	0.664982	0.696726	0.861564	0.741091
NORWAY	0.355470	0.637892	0.825069	0.606144	0.842589	1.13557	1.47711	1.17176	0.599030	0.916728	1.15109	0.888950
POLAND	0.666661	0.823488	1.18686	0.891671	1.21434	1.10752	1.33955	1.22047	0.940501	0.965502	1.26221	1.056607
SPAIN	3.40542	1.97762	0.943421	2.10882	1.69091	1.43521	0.676831	1.26765	2.54317	1.70641	0.810126	1.68824
IRELAND	0.0776120E	0.104493	0.124224	0.102110	1.00841	0.971888	0.983105	0.787802	0.543013	0.581890	0.553664	0.544956
AUSTRALIA	2.40593	1.94101	2.05104	2.13266	2.61958	2.80896	3.09663	2.84172	2.51275	2.37498	2.57383	2.48719
NEW ZEALAND	0.0616143E	0.162206	0.409033	0.210951	0.947300	1.12081	1.39129	1.15113	0.504457	3.641508	0.300163	0.682043
U.K.	13.7255	10.5088	11.0810	11.7718	18.7778	19.3203	20.5731	19.7237	16.2517	15.1646	15.3270	15.7478
MEXICO	0.448189	0.371192	0.421908	0.413763	0.489922	1.70706	0.584444	0.961142	0.467055	1.0913	0.554176	0.687453

Year		B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
1930	1	100.483	100.634	100.473	100.530	100.682	100.481	100.326	100.496	100.583	100.557	100.400	100.513
	2	100.965	101.165	100.560	100.996	101.166	100.809	100.591	100.822	101.015	100.987	100.726	100.909
	3	101.145	101.382	101.024	101.183	101.305	101.000	100.729	101.211	101.225	101.191	100.876	101.097
	4	100.991	101.220	100.940	101.050	101.254	100.995	100.763	101.004	101.123	101.108	100.851	101.327
	5	101.120	101.391	101.055	101.189	101.504	101.178	100.587	101.190	101.312	101.284	100.971	101.189
	6	101.578	101.977	101.498	101.685	102.372	101.815	101.529	101.838	101.975	101.896	101.414	101.762
	7	101.881	102.312	101.769	101.987	102.676	102.092	101.506	102.118	102.279	102.202	101.678	102.053
	8	102.313	102.476	101.910	102.133	102.802	102.242	101.739	102.261	102.408	102.359	101.824	102.197
	9	101.896	102.354	101.768	102.006	102.577	102.044	101.556	102.359	102.237	102.199	101.562	102.033
	10	102.342	102.867	102.136	102.448	103.203	102.405	101.855	102.421	102.673	102.636	101.996	102.435
	11	102.261	102.737	102.078	102.359	102.869	102.328	101.849	102.348	102.565	102.532	101.964	102.354
	12	102.811	103.380	102.586	102.926	103.534	102.978	102.352	102.983	103.283	103.177	102.469	102.957
1931	13	103.768	104.536	103.467	103.924	104.842	103.964	103.260	104.022	104.305	104.250	103.164	103.973
	14	103.920	104.820	103.776	104.172	105.364	104.596	103.810	104.657	104.742	104.708	103.793	104.414
	15	103.244	104.336	103.261	103.513	104.811	104.215	103.435	104.087	104.028	104.025	103.348	103.800
	16	103.199	104.247	103.400	103.682	105.208	104.167	103.558	104.245	104.204	104.207	103.479	103.963
	17	104.309	105.262	104.177	104.583	105.892	104.907	104.241	105.014	105.101	105.284	104.209	104.798
	18	104.271	105.179	104.039	104.480	105.838	104.778	104.040	104.885	105.030	104.978	104.040	104.683
	19	104.514	105.479	104.318	104.770	106.059	105.251	104.346	105.152	105.287	105.265	104.332	104.961
	20	105.692	106.865	105.483	106.013	107.420	106.913	105.344	106.626	106.556	106.889	105.513	106.319
	21	107.646	108.837	107.287	107.923	109.608	109.011	107.953	108.857	108.627	108.924	107.520	108.390
	22	113.753	114.599	112.603	113.652	117.296	116.868	116.539	116.901	115.524	115.734	114.571	115.276
	23	113.507	114.441	112.664	113.537	117.292	117.181	117.195	117.223	115.400	115.811	114.930	115.380
	24	117.534	118.477	116.497	117.536	123.185	123.304	123.664	123.384	120.409	120.591	120.080	120.460
1932	25	117.353	118.243	116.158	117.251	123.333	123.401	123.578	123.437	120.343	120.822	119.868	120.344
	26	117.211	118.214	116.045	117.157	123.349	123.447	123.437	123.411	120.280	120.831	119.741	120.254
	27	115.570	116.687	114.561	115.606	121.483	121.547	121.176	121.435	118.527	119.167	117.868	118.521
	28	115.202	116.266	114.169	115.146	120.718	120.749	120.113	120.527	117.860	118.508	117.141	117.836
	29	115.793	117.018	114.877	115.896	121.890	122.117	121.623	121.810	118.842	119.568	118.150	118.853
	30	115.372	116.596	114.494	115.487	121.860	122.323	121.428	121.570	118.616	119.460	117.961	118.679
	31	116.155	117.441	115.239	116.278	123.357	123.856	122.989	123.401	119.756	120.648	119.114	119.839
	32	116.900	118.208	115.957	117.022	124.847	125.442	124.650	124.980	120.874	121.825	120.304	121.201
	33	116.744	118.071	115.853	116.889	124.830	125.422	124.700	124.984	121.787	121.747	120.276	120.937
	34	117.679	118.999	116.745	117.808	126.214	126.801	126.179	126.398	121.947	122.900	121.462	122.103
	35	119.040	120.315	117.927	119.094	128.653	129.462	128.881	129.365	123.947	124.889	123.404	124.080
	36	118.980	120.248	117.816	119.015	128.894	129.413	128.740	129.016	123.937	124.830	123.278	124.315
1933	37	118.527	119.968	117.759	118.751	126.363	129.129	128.388	129.627	123.445	124.548	123.073	123.689
	38	118.790	120.295	118.397	119.061	129.003	129.916	129.126	129.349	123.897	125.106	123.612	124.205
	39	118.532	119.986	117.835	118.784	128.417	129.352	128.639	128.803	123.475	124.669	123.237	123.794
	40	119.450	120.813	118.792	119.678	129.622	130.551	129.783	129.985	124.536	125.692	124.267	124.532
	41	122.096	123.275	121.394	122.255	133.559	134.329	133.650	133.846	127.827	128.802	127.522	128.050
	42	122.333	123.409	121.791	122.511	134.098	134.967	134.193	134.420	128.215	129.188	127.992	128.465
	43	125.442	126.309	124.903	125.551	138.770	139.492	138.552	138.938	132.106	132.900	131.728	132.245
	44	125.117	126.030	124.759	125.302	139.234	140.099	139.160	139.498	132.175	133.265	131.960	132.400
	45	126.730	129.508	128.285	128.841	144.702	145.500	144.652	144.985	136.716	137.554	136.669	136.913
	46	128.261	129.302	127.933	128.399	144.189	145.155	144.241	144.528	136.225	137.378	136.082	136.463

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
47	129.051	129.582	128.678	129.104	145.140	145.902	144.762	145.268	137.096	137.742	136.720	137.186
48	128.809	129.475	128.534	128.772	143.295	143.897	142.763	143.318	136.352	136.686	135.198	136.945
49	130.536	131.167	129.701	130.468	145.766	146.466	145.400	145.877	138.151	138.816	137.551	138.173
50	135.489	136.201	134.140	135.277	151.648	152.219	151.164	151.577	143.569	144.210	142.652	143.477
51	136.323	137.035	134.950	136.102	152.942	153.436	152.351	152.910	144.632	145.235	143.651	144.506
52	136.516	137.234	135.297	136.282	153.065	153.474	152.308	152.949	144.790	145.354	143.702	144.615
53	137.376	138.156	135.819	137.117	154.249	154.373	153.165	153.862	145.711	146.254	144.492	145.490
54	137.735	138.426	136.224	137.455	154.476	154.881	153.784	154.380	146.296	146.654	145.204	145.918
55	138.239	139.007	136.653	138.033	155.136	155.569	154.577	155.094	146.687	147.288	145.715	146.563
56	138.279	138.989	137.266	138.111	155.662	156.232	155.255	155.716	146.970	147.611	146.161	146.914
57	138.783	139.531	137.527	138.614	156.411	157.119	156.188	156.573	147.597	148.325	146.858	147.593
58	138.279	139.284	136.965	138.110	156.039	156.761	155.773	156.191	147.159	147.923	146.369	147.150
59	137.595	138.445	136.281	137.440	154.949	155.522	154.455	154.975	146.272	146.984	145.368	146.208
60	138.544	139.510	137.271	138.475	156.204	156.846	155.844	156.238	147.424	148.178	146.558	147.387
61	136.698	139.546	137.333	138.526	156.356	157.110	156.179	156.548	147.527	148.328	146.756	147.537
62	138.829	139.628	137.458	138.638	156.572	157.417	156.550	156.846	147.700	148.522	147.304	147.742
63	138.471	139.299	137.075	138.282	155.875	156.929	156.231	156.345	147.173	148.114	146.653	147.313
64	101.845	102.747	101.437	102.010	114.119	114.832	114.317	114.423	107.982	108.790	107.877	108.216
65	101.417	102.309	101.054	101.593	113.433	114.153	113.669	113.752	107.425	108.231	107.361	107.672
66	100.918	101.802	100.605	101.109	112.937	113.605	113.107	113.217	106.928	107.704	106.856	107.163
67	100.536	101.429	100.249	100.738	112.583	113.191	112.657	112.810	106.560	107.310	106.453	106.774
68	100.314	101.228	100.063	100.535	112.412	112.961	112.387	112.586	106.363	107.094	106.225	106.561
69	100.610	101.516	100.324	100.817	112.717	113.329	112.771	112.939	106.663	107.423	106.548	106.878
70	100.601	101.534	100.345	100.827	113.017	113.595	112.990	113.201	106.809	107.564	106.668	107.014
71	100.990	102.027	100.776	101.264	113.895	114.242	113.452	113.863	107.442	108.134	107.114	107.584
72	100.714	101.753	100.512	100.993	113.502	113.943	113.154	113.568	107.161	107.848	106.833	107.281
73	100.796	101.870	100.605	101.090	113.849	114.079	113.215	113.714	107.322	107.975	106.910	107.402
74	100.611	101.619	100.415	100.881	113.536	113.836	113.039	113.470	107.073	107.727	106.727	107.176
75	100.746	101.773	100.544	101.021	113.674	113.993	113.187	113.618	107.210	107.883	106.865	107.319
76	100.872	101.910	100.663	101.148	113.767	114.101	113.297	113.721	107.319	108.005	106.980	107.435
77	100.799	101.832	100.597	101.276	113.584	113.901	113.283	113.523	107.192	107.866	106.840	107.299
78	100.179	101.194	99.9893	100.454	112.767	113.046	112.218	112.677	106.473	107.120	106.104	106.566
79	100.038	101.053	99.8272	100.306	112.654	112.921	112.097	112.557	106.346	106.987	105.962	106.432
80	100.035	101.092	99.8916	100.339	112.673	112.937	112.100	112.570	106.354	107.015	105.996	106.455
81	100.383	101.471	100.242	100.699	113.017	113.256	112.320	112.864	106.700	107.364	106.281	106.782
82	110.543	111.584	109.471	110.533	119.727	120.467	118.864	119.636	115.135	116.025	114.167	115.109
83	111.026	112.087	109.957	111.224	120.328	121.287	119.481	120.299	115.677	116.587	114.719	115.561
84	110.249	111.292	109.285	110.275	120.176	120.545	118.938	119.753	115.012	115.919	114.111	115.014
85	109.854	110.898	108.923	109.892	119.406	120.185	118.583	119.391	114.530	115.541	113.753	114.642
86	110.243	111.090	109.294	110.276	119.575	120.366	118.759	119.566	114.809	115.728	113.927	115.421
87	110.269	111.335	109.321	110.308	119.701	120.518	118.894	119.704	114.985	115.926	114.107	115.206
88	110.479	111.565	109.541	110.528	119.600	120.436	118.747	119.594	115.039	116.001	114.144	115.061
89	110.358	111.450	109.428	110.412	119.370	120.192	118.478	119.346	114.864	115.821	113.953	114.879
90	110.482	111.578	109.545	110.535	119.465	120.294	118.563	119.441	114.974	115.936	114.354	114.988
91	113.382	114.713	112.425	113.507	120.629	121.667	119.565	120.620	117.306	118.190	115.995	117.264
92	113.687	114.820	112.438	113.648	120.535	121.579	119.444	120.519	117.111	118.200	115.941	117.284
93	115.458	116.606	114.065	115.377	121.611	122.779	120.508	121.632	118.534	119.693	117.287	118.505
94	116.995	116.181	115.515	116.897	122.595	123.833	121.648	122.525	119.795	121.307	118.581	119.761
95	117.445	116.630	115.953	117.342	123.113	124.307	121.915	123.112	120.279	121.469	118.934	120.227
96	117.807	119.259	116.387	117.751	123.626	124.792	122.458	123.206	120.717	121.626	119.423	120.417
97	117.703	116.945	116.233	117.627	123.209	124.405	122.308	123.207	120.456	121.675	119.120	120.617
98	116.690	119.962	117.027	116.560	123.718	124.891	122.410	123.673	121.204	122.427	119.719	121.116

1934
1935
1936
1937

		B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
1938	99	120.280	121.612	118.435	120.109	124.574	125.885	123.148	124.536	122.427	123.749	120.791	122.322
	100	120.295	121.666	118.510	120.157	124.773	126.169	123.257	124.733	122.534	123.917	120.884	122.445
	101	123.278	124.752	121.319	123.116	126.755	128.238	126.848	126.614	125.016	126.495	123.084	126.865
	102	125.593	126.774	123.155	125.207	129.377	130.584	126.708	128.890	127.235	128.679	124.932	126.969
	103	125.344	127.062	123.415	125.274	129.716	130.258	126.977	129.217	127.530	129.010	125.196	127.245
	104	126.122	127.937	124.186	126.082	130.790	131.931	127.745	130.155	128.456	129.934	125.966	128.119
	105	127.525	129.309	125.459	127.431	131.862	133.210	129.340	131.370	129.693	131.259	127.250	129.401
	106	128.364	130.236	126.279	128.293	133.068	134.292	129.987	132.449	130.716	132.264	128.133	130.371
	107	129.731	131.659	127.488	129.626	134.342	135.550	131.208	133.700	132.037	133.604	129.348	131.663
	108	129.723	131.642	127.416	129.591	134.750	135.526	131.260	133.672	131.386	133.584	129.328	131.633
1939	109	130.305	131.910	127.705	129.873	134.545	135.892	131.587	134.208	132.275	133.901	129.646	131.941
	110	129.614	131.516	127.336	129.488	134.174	135.400	131.104	133.560	131.894	133.458	129.220	131.524
	111	129.393	131.270	127.117	129.260	133.841	135.278	130.809	133.243	131.617	133.174	128.963	131.251
	112	129.639	131.537	127.391	129.523	134.168	135.413	131.160	133.580	131.904	133.475	129.276	131.551
	113	130.921	132.830	128.626	130.792	135.551	136.810	132.517	134.959	133.236	134.820	130.572	132.876
	114	131.336	133.448	129.138	131.307	136.944	137.767	133.096	135.936	134.140	135.608	131.117	133.622
	115	131.954	134.435	129.959	132.116	139.267	139.047	134.202	137.705	135.610	137.341	132.381	134.911
		134.427	137.747	132.734	134.969	145.815	144.585	137.671	142.690	140.121	141.166	135.203	138.830

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
EGYPT	0.657587	0.914658	0.731147	0.767797	0.863618	0.951930	0.861288	0.892278	0.760602	0.933294	0.796217	0.830038
S.AFRICA	0.789771	1.07622	1.52809	1.11136	1.08507	1.57800	1.71556	1.45954	0.937419	1.32711	1.62182	1.29545
CANADA	2.02206	1.40756	1.29671	1.57544	4.65668	4.16858	4.48894	4.43807	3.33337	2.78807	2.89283	3.00675
U.S.A.	9.31904	7.52799	9.86609	8.90437	14.3071	11.9034	12.2863	12.8322	11.8131	9.71568	11.0762	10.8583
BRAZIL	1.25629	1.40756	1.44399	1.36928	1.66054	1.60960	1.75679	1.67564	1.43841	1.50858	1.60039	1.52246
ARGENTINA	5.61074	5.95334	4.04003	5.20137	3.31431	2.70871	2.55759	2.86020	4.46252	3.33102	3.29881	4.03379
INDIA	2.82660	2.73844	2.66184	2.74229	4.05668	3.71791	3.64715	3.80725	3.44164	3.22818	3.15449	3.27477
JAPAN	0.622695	0.813328	0.507619	0.647881	3.65288	3.75661	3.18377	3.53042	2.13679	2.23897	1.84570	2.08915
CHINA	0.657587	0.999548	0.804785	0.920640	2.33324	1.58826	0.983041	1.63685	1.49591	1.29391	0.896413	1.22874
RUSSIA	0.422394	2.43645	3.02218	1.95967	1.43499	1.58951	1.48230	1.50227	0.923593	2.01198	2.25224	1.73397
AUSTRIA	0.290210	0.355999	0.289321	0.311843	1.11238	0.955125	1.02589	1.03153	0.701293	0.656162	0.657604	0.671686
BELGIAN COLONIES	2.42617	3.61469	4.65309	3.56665	0.110853	0.172353	0.267362	0.183689	0.126851	1.89952	2.46347	1.87417
CZECHOSLOVAKIA	0.429777	0.788667	1.01001	0.742818	1.88798	1.61445	1.58758	1.69667	1.15888	1.20156	1.29879	1.21974
FRANCE	18.9702	19.0870	17.2882	18.4485	9.00529	10.3368	8.39301	9.24670	13.3873	14.7119	12.3431	13.8476
GERMANY	13.8705	12.0218	12.9484	12.9469	10.4258	9.32549	10.1220	9.95776	12.1481	10.6736	11.5352	11.6523
ITALY	1.80366	2.08399	1.15990	1.68251	3.12233	2.82962	2.52294	2.82430	2.46199	2.43580	1.84142	2.25360
NETHERLANDS	13.7787	11.6877	12.3197	12.5954	4.77546	5.07392	5.43123	5.09154	9.27708	8.38083	8.87545	4.84465
SWEDEN	0.964230	1.84133	2.60912	1.81822	1.60767	2.29195	2.86440	2.25434	1.28595	2.08614	2.73676	2.03628
SWITZERLAND	1.81104	2.08399	2.03832	1.97778	1.63216	2.04380	1.92614	1.86736	1.72160	2.05389	1.98223	1.92257
DENMARK	0.585957	0.805108	0.725917	0.705661	1.66323	1.87455	2.10943	1.84240	1.17459	1.33883	1.41767	1.29405
FINLAND	1.16620	1.22134	1.08365	1.15706	0.830082	0.841222	1.10688	0.927028	0.993590	1.03128	1.09626	1.04204
NORWAY	0.820971	1.16111	1.08888	1.02365	0.808300	1.15211	1.44978	1.15673	0.816635	1.15561	1.26933	1.00319
POLAND	0.675866	1.49245	1.44660	1.20497	1.16478	1.06853	1.31654	1.18328	0.920321	1.20349	1.38157	1.19413
SPAIN	0.863246	1.34733	0.802170	1.00425	1.62192	1.38277	0.664352	1.22301	1.24258	1.36505	0.733261	1.11363
IRELAND	0.218580	0.457329	0.368189	0.364033	0.967196	0.935780	0.964575	0.955850	0.572888	0.696555	0.666182	0.651961
AUSTRALIA	1.40490	1.96890	1.85705	1.74362	2.51214	2.71045	3.04449	2.75570	1.95552	2.33968	2.45077	2.24956
NEW ZEALAND	0.0367377	0.178000	0.215683	0.143473	0.908104	1.08169	1.36817	1.11932	0.472621	0.629343	0.791223	0.631137
U.K.	15.4834	12.1424	11.7646	13.1301	18.0133	19.0257	20.1848	19.0973	16.7474	15.5190	15.9747	15.1137
MEXICO	0.214889	0.347779	0.428751	0.330673	0.470103	1.64124	0.675122	0.278753	0.342696	0.994607	0.551737	0.629635

		H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12
1930	1	100.390	100.564	100.345	100.433	100.674	100.470	100.319	100.487	100.532	100.517	100.460	100.352
	2	100.519	100.724	100.561	100.534	100.794	100.533	100.320	100.549	100.656	100.628	100.541	100.542
	3	100.624	100.873	100.638	100.630	100.972	100.660	100.387	100.673	100.798	100.766	100.602	100.655
	4	100.586	100.823	100.416	100.616	101.008	100.744	100.510	100.754	100.797	100.783	100.475	100.685
	5	100.803	101.090	100.634	100.842	101.346	101.015	100.724	101.028	101.074	101.052	100.679	100.935
	7	101.137	101.582	100.956	101.090	102.167	101.603	101.682	101.652	101.593	101.150	101.035	101.427
	8	101.320	101.777	101.093	101.397	102.167	101.787	101.603	101.815	101.848	101.782	101.187	101.806
	9	101.496	101.986	101.256	101.579	102.596	102.030	101.523	102.050	102.163	102.008	101.389	101.814
	10	101.690	102.167	101.391	101.749	102.637	102.097	101.605	102.113	102.163	102.132	101.498	101.931
	11	102.122	102.641	101.704	102.156	103.111	102.506	101.953	102.523	102.616	102.573	101.829	102.339
	12	101.866	102.303	101.526	101.898	102.833	102.286	101.806	102.308	102.350	102.295	101.666	102.101
1931	13	102.254	102.804	101.849	102.302	103.508	102.842	102.204	102.851	102.881	102.823	102.026	102.577
	14	103.066	103.717	102.506	103.096	104.805	103.914	103.197	103.935	103.816	103.816	102.852	103.534
	15	102.819	103.598	102.411	102.943	105.293	104.312	103.510	104.372	103.957	103.955	102.961	103.657
	16	102.046	102.715	101.691	102.217	104.455	103.643	103.061	103.719	103.250	103.179	102.475	102.968
	17	102.453	103.162	102.281	102.632	104.998	104.148	103.538	104.228	103.726	103.655	102.910	103.430
	18	103.240	104.018	102.894	103.384	105.899	104.895	104.211	105.002	104.569	104.456	103.553	104.193
	19	103.410	104.205	102.946	103.520	105.944	104.873	104.130	104.983	104.677	104.539	103.538	104.251
	20	104.214	104.941	103.533	104.229	106.327	105.278	104.573	105.393	105.271	104.456	104.311	104.311
	21	104.795	105.777	104.893	104.893	107.620	107.104	105.704	106.809	106.440	106.053	104.053	104.851
	22	106.897	107.778	106.170	106.948	110.113	109.541	106.872	109.375	106.208	106.440	104.905	105.851
	23	112.631	113.270	111.790	112.564	117.208	116.843	109.375	108.505	108.659	107.321	106.162	108.162
	24	112.778	113.480	112.448	112.902	117.861	117.735	116.459	116.869	114.965	115.060	114.716	114.716
	25	116.216	116.780	116.018	116.338	123.419	123.447	123.540	123.469	120.447	120.800	115.071	115.333
1932	26	117.034	116.851	116.810	117.199	123.852	123.948	124.220	124.009	120.447	120.565	120.605	120.605
	27	114.636	114.760	114.281	114.798	121.759	121.893	121.345	121.666	118.197	117.813	114.125	114.716
	28	114.255	115.476	113.910	114.470	121.038	121.073	120.385	120.832	118.158	118.685	117.813	118.232
	29	115.028	115.958	114.683	115.223	122.139	122.366	121.617	122.041	119.162	119.162	117.651	117.651
	30	115.220	116.154	114.915	115.430	122.661	123.140	122.198	122.666	118.583	118.583	118.632	118.632
	31	115.952	116.896	115.752	116.200	124.194	124.700	123.773	124.222	119.940	119.647	119.044	119.044
	32	116.582	117.502	116.470	116.851	125.624	126.213	125.349	125.729	120.798	120.211	120.211	120.211
	33	116.265	117.164	116.202	116.544	125.388	125.956	125.147	125.447	121.103	121.857	121.290	121.290
	34	117.178	118.081	117.175	117.478	126.763	127.334	126.898	127.707	121.970	121.560	120.674	120.674
	35	116.674	119.520	118.708	118.967	129.651	130.211	129.541	129.808	124.162	124.875	124.125	124.125
	36	120.851	121.793	120.863	121.169	133.178	133.170	132.403	132.721	125.720	126.633	126.633	126.387
1933	37	117.702	118.574	116.883	116.053	128.830	129.552	128.89	129.024	123.266	124.063	123.286	123.538
	38	117.244	118.032	116.180	117.548	128.579	129.430	128.516	128.842	123.912	123.731	122.941	123.195
	39	117.341	118.070	117.366	117.612	128.324	129.212	128.383	128.640	122.833	123.641	123.176	123.176
	40	117.699	118.373	117.426	117.936	128.636	129.602	128.739	128.993	123.168	123.988	123.237	123.464
	41	120.608	121.052	120.685	120.782	133.474	134.335	133.165	133.676	127.041	127.620	127.025	127.229
	42	120.174	120.599	120.456	120.410	133.529	134.335	133.417	133.760	126.851	126.937	126.937	127.229
	43	123.076	123.370	123.510	123.319	138.864	139.521	138.415	138.933	130.970	131.445	130.763	131.126
	44	123.114	123.497	123.828	123.480	139.587	140.346	139.281	139.751	131.350	131.941	131.555	131.615
	65	126.311	126.581	127.208	126.700	145.013	145.862	144.748	145.208	135.662	136.222	135.978	135.754
	66	125.932	126.166	126.889	126.329	144.561	145.446	144.341	144.783	135.247	135.806	135.615	135.556

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12
47	126.444	126.499	127.221	126.721	145.679	146.386	145.076	145.713	136.062	136.442	136.148	136.217
48	126.158	126.235	126.346	126.246	143.671	144.196	142.876	143.581	134.915	135.215	134.611	134.914
49	127.642	127.645	127.654	127.714	145.698	146.515	145.258	145.890	136.770	137.080	136.558	136.802
50	132.121	132.082	131.940	132.048	151.647	152.114	150.839	151.534	141.884	142.098	141.390	141.791
51	133.050	133.057	132.907	133.005	153.134	153.529	152.226	152.963	143.092	143.293	142.567	142.984
52	133.593	133.601	133.307	133.500	153.586	153.897	152.509	153.330	143.589	143.749	142.908	143.415
53	134.503	134.525	134.077	134.368	154.620	154.838	153.396	154.284	144.561	144.681	143.736	144.326
54	135.599	135.527	135.095	135.407	155.432	155.742	154.411	155.195	145.516	145.634	144.753	145.301
55	135.591	135.536	135.305	135.477	155.880	156.214	154.989	155.694	145.735	145.875	145.147	145.586
56	134.719	134.696	134.767	134.727	155.564	156.027	154.817	155.470	145.142	145.361	144.792	145.098
57	135.193	135.191	135.358	135.248	156.521	157.117	155.949	156.529	145.857	146.154	145.654	145.888
58	135.236	135.294	135.436	135.322	156.949	157.575	156.344	156.956	146.093	146.434	145.890	146.139
59	134.350	134.461	134.481	134.431	155.625	156.098	154.798	155.507	144.987	145.280	144.639	144.969
60	135.046	135.117	135.167	135.111	156.574	157.109	155.871	156.518	145.810	146.113	145.519	145.816
61	135.182	135.250	135.356	135.263	156.731	157.378	156.206	156.772	145.957	146.314	145.781	146.017
62	135.504	135.503	135.692	135.566	157.172	157.914	156.807	157.298	146.338	146.708	146.250	146.432
63	137.092	137.034	137.314	137.147	159.378	160.296	159.104	159.659	148.235	148.665	148.309	148.403
64	139.786	140.067	140.410	140.088	158.616	159.728	158.980	159.108	149.201	149.897	149.695	149.598
65	139.671	139.926	140.290	139.962	158.221	159.350	158.651	158.740	148.946	149.638	149.471	149.351
66	139.364	139.653	140.077	139.698	158.051	159.118	158.195	158.522	148.707	149.386	149.236	149.110
67	139.371	139.698	140.097	139.722	158.107	159.095	158.323	158.508	148.739	149.397	149.210	149.115
68	138.885	139.264	139.664	139.271	157.664	158.568	157.746	157.993	148.275	149.077	148.705	146.632
69	138.976	135.353	139.767	139.365	157.826	158.801	157.998	158.208	148.401	149.077	148.883	148.787
70	139.567	135.992	140.395	139.985	158.801	159.748	158.680	159.143	149.184	149.870	149.637	149.564
71	139.669	140.306	140.594	140.190	159.659	160.282	159.153	159.698	149.664	150.294	149.874	149.944
72	139.588	140.233	140.522	140.117	156.565	150.174	159.046	159.595	149.577	150.203	149.787	149.856
73	139.804	140.528	140.759	140.364	160.048	160.510	159.275	159.944	149.926	150.519	150.017	150.154
74	139.787	140.413	140.713	140.305	159.837	160.402	159.260	159.833	149.812	150.408	149.987	150.269
75	139.840	140.483	140.755	140.359	159.883	160.469	159.317	159.890	149.861	150.476	150.036	150.124
76	139.530	140.191	140.454	140.058	159.478	160.081	158.935	159.498	149.504	150.136	149.694	149.778
77	138.680	139.344	139.608	139.211	158.978	158.978	157.820	158.401	148.542	149.161	148.714	145.806
78	138.248	138.910	139.144	138.767	157.690	158.214	157.045	157.650	147.969	148.562	148.394	148.209
79	138.974	139.617	139.809	139.467	156.488	159.005	157.843	158.442	148.731	149.311	148.621	148.954
80	138.841	139.567	139.778	139.395	156.522	159.034	157.843	158.466	148.681	149.300	149.910	148.731
81	136.280	136.995	137.235	136.837	155.488	155.987	154.751	155.409	145.884	146.491	145.993	146.123
82	115.025	116.194	116.404	115.675	131.551	132.253	130.602	131.469	123.288	124.224	123.503	123.672
83	116.105	117.531	117.406	117.014	133.102	133.757	131.900	132.920	124.603	125.644	124.653	124.967
84	116.840	118.426	118.182	117.816	134.230	134.877	132.890	133.999	125.535	125.651	125.536	125.902
85	117.088	119.655	119.220	118.921	135.679	136.447	134.182	135.436	126.784	128.051	126.701	127.178
86	117.967	119.796	119.258	119.007	135.795	136.554	134.229	135.526	126.881	128.175	126.744	127.267
87	116.340	120.299	119.587	119.409	136.319	137.076	134.627	136.307	127.329	128.688	127.107	127.708
88	115.383	120.481	119.600	119.488	136.409	137.155	134.544	136.036	127.396	128.818	127.072	127.762
89	118.713	120.918	119.856	119.829	136.769	137.477	134.750	136.332	127.741	128.197	127.303	125.081
90	116.901	121.149	120.007	120.019	137.003	137.704	134.918	136.542	127.952	129.427	127.461	128.280
91	120.324	122.970	121.634	121.643	139.074	140.012	136.746	138.611	129.699	131.491	129.190	130.127
92	119.965	122.157	121.211	121.111	138.383	139.421	136.394	138.066	129.174	130.789	128.602	129.589
93	120.817	123.033	122.084	121.978	139.539	140.732	137.572	139.281	130.178	131.883	129.628	130.630
94	121.791	124.133	123.116	123.013	141.028	142.290	138.952	140.756	131.410	133.211	131.034	131.885
95	121.463	123.789	122.774	122.675	140.700	141.887	138.566	140.384	131.081	132.838	130.670	131.530
96	122.165	124.541	123.599	123.435	141.876	143.028	139.743	141.549	132.020	133.785	131.671	132.492
97	122.565	124.995	123.939	123.834	142.257	143.447	140.061	141.922	132.413	134.221	132.000	132.878
98	123.431	125.677	124.585	124.631	143.069	144.229	140.727	142.675	133.250	135.053	132.65	133.653

1934
1935
1936
1937

1938

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12
97	124.131	126.716	125.158	125.335	143.971	145.267	141.426	143.555	134.051	135.991	133.232	134.445
99	124.293	126.980	125.393	125.555	144.457	145.255	141.791	144.034	134.375	136.418	133.592	134.795
101	125.155	126.093	126.410	126.553	146.325	147.026	143.235	145.795	135.740	137.959	134.823	136.174
102	125.578	126.875	126.994	127.149	148.205	149.358	144.215	147.259	136.891	139.116	135.604	137.204
103	125.445	128.819	126.880	127.048	148.197	149.383	144.113	147.231	136.821	139.101	135.497	137.139
104	125.259	128.748	126.784	126.930	148.505	149.568	144.108	147.393	136.882	139.158	135.446	137.162
105	125.077	128.601	126.473	126.717	148.193	149.419	143.905	147.172	136.635	139.010	135.189	136.945
125	126.530	130.262	127.969	128.254	150.569	151.651	145.900	149.373	138.549	140.956	136.934	138.813
107	127.551	131.324	127.871	129.249	151.827	152.880	147.070	150.592	139.689	142.102	137.971	139.920
123	128.197	131.956	129.438	129.861	152.453	153.584	147.802	151.280	140.325	142.769	138.620	140.571

1939

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12
107	127.904	131.758	129.088	129.583	152.172	153.331	147.434	150.979	140.038	142.544	138.261	140.281
113	125.916	129.379	127.338	127.544	149.564	150.694	145.213	148.490	137.740	140.037	136.276	138.017
111	124.507	127.690	126.063	126.087	147.598	148.803	143.618	146.673	136.053	138.246	134.841	136.380
112	124.496	127.553	126.185	126.078	147.621	148.877	143.833	146.779	136.058	138.215	135.011	136.428
113	125.182	128.095	126.968	126.748	148.523	149.838	144.358	147.760	136.853	138.966	135.943	137.254
114	124.500	127.706	126.460	126.222	148.628	149.658	144.358	147.615	136.664	138.682	135.409	136.919
115	125.415	129.198	127.671	127.428	151.879	152.243	146.050	150.057	138.647	140.721	136.861	138.743
115	128.049	133.161	130.955	130.722	159.750	158.289	150.451	156.163	143.899	145.725	140.703	163.442

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12
EGYPT	0.292656C	0.322709	0.524052	0.398804	0.864145	0.950105	0.857319	0.890523	0.578398	0.636407	0.690686	0.635163
S.AFRICA	0.533677	0.560238	1.09767	0.730527	1.08742	1.58208	1.71199	1.46050	0.810549	1.07116	1.40483	1.09551
CANADA	1.41027	0.867368	1.30109	1.19358	4.66098	4.15889	4.46261	4.42749	3.03562	2.51313	2.88285	2.81053
U.S.A.	7.36625	6.24193	7.86105	7.15641	14.3127	11.8759	12.2029	12.7972	10.3395	9.05893	10.0320	9.97680
BRAZIL	0.657446	0.715017	1.01980	0.757422	1.66207	1.60648	1.74741	1.67199	1.15976	1.16075	1.38361	1.23470
ARGENTINA	5.06709	4.85277	3.14797	4.35594	3.31625	2.70149	2.54397	2.85390	4.19167	3.77713	2.84597	3.60492
INDIA	2.16925	1.53079	1.87318	1.85774	4.05952	3.71140	3.62594	3.79895	3.14138	2.62109	2.74956	2.82835
JAPAN	0.508725	0.544659	0.474491	0.509292	3.65632	3.75589	3.16893	3.52704	2.08252	2.15027	1.82171	2.01817
CHINA	0.471115	0.970554	0.732996	0.724888	2.33786	1.59032	0.985296	1.63782	1.40449	1.28344	0.859146	1.13136
RUSSIA	0.597958	2.19422	2.51762	1.76993	1.43751	1.58486	1.47472	1.49903	1.01774	1.88954	1.93617	1.63448
AUSTRIA	0.514872	0.611831	0.570093	0.555599	1.11459	0.956355	1.02163	1.03086	0.314733	0.784093	0.795863	0.798230
BELGIUM-LUX.	11.0093	11.8672	12.0145	11.6303	3.24419	3.94840	4.58105	3.92455	7.12676	7.90779	8.29776	7.77744
CZECHSLOVAKIA	0.882742	1.85350	1.80236	1.51287	1.89006	1.61212	1.57866	1.69361	1.34640	1.73281	1.69051	1.60324
FRANCE	6.34636	7.08644	6.41619	6.61633	9.01622	10.3332	8.35952	9.21630	7.68129	8.70980	7.38785	7.92632
GERMANY	27.5872	24.3019	19.7161	23.8684	10.4406	9.31092	10.0686	9.94002	19.0139	16.5064	14.5924	16.9042
ITALY	1.33333	1.98784	1.16497	1.49538	3.12676	2.83154	2.51179	2.82336	2.23005	2.40969	1.83838	2.15937
DUTCH COLONIES	7.63729	5.73086	9.22213	7.53076	1.52235	1.36953	1.58435	1.49208	4.57982	3.55019	5.40424	4.51162
SWEDEN	1.64651	2.51450	3.11601	2.42567	1.60977	2.28954	2.85101	2.25011	1.62814	2.40202	2.98351	2.33789
SWITZERLAND	1.16753	2.02143	1.99709	1.72868	1.63481	2.04496	1.91694	1.86557	1.40117	2.03320	1.95701	1.79713
DENMARK	1.00307	0.618831	0.807338	0.807415	1.66522	1.37274	2.09889	1.87895	1.33414	1.24228	1.45311	1.34318
FINLAND	1.10189	0.697010	1.11541	0.971435	0.831607	0.839776	1.10310	0.924828	0.580687	0.764393	1.10925	0.943132
NORWAY	0.951451	0.934540	1.35617	1.08072	0.809922	1.15218	1.44379	1.15530	0.580687	1.04336	1.39994	1.10801
POLAND	1.18633	1.27526	1.51907	1.32689	1.16684	1.06696	1.31003	1.13123	1.17659	1.17111	1.41455	1.25408
SPAIN	0.956243	1.69872	0.524052	1.05967	1.62683	1.35322	1.36094	1.23321	1.20053	1.54097	0.592815	1.14144
IRELAND	0.192478	0.237530	0.191205	0.207071	0.968799	0.936853	0.960791	0.955481	0.580638	0.587191	0.573998	0.551276
AUSTRALIA	0.344273	0.322070	0.357628	0.341537	2.51565	2.70598	1.02880	2.75014	1.42996	1.51434	1.69322	1.54584
NEW ZEALAND	0.0704277E	0.118765	0.166424	0.118539	0.908727	1.07957	1.36094	1.11644	0.489577	0.59215	0.763682	0.517691
U.K.	16.7751	16.9536	17.1521	16.9603	18.0430	19.1024	20.1059	17.0838	17.4391	13.0280	13.5290	13.0220
MEXICO	0.219149	0.374301	0.237245	0.276899	0.471266	1.54629	0.671502	0.922486	0.145207	1.01030	0.454374	0.453297

	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
1930												
1	100.888	100.872	100.697	100.819	100.919	100.710	100.552	100.727	100.903	100.791	100.625	100.773
2	100.985	101.007	100.790	100.927	101.064	100.801	100.585	100.817	101.025	100.904	100.668	100.872
3	101.007	101.643	101.167	101.346	101.505	101.192	100.915	101.216	101.466	101.317	101.041	101.275
4	101.383	101.362	101.123	101.290	101.471	101.205	100.971	101.216	101.427	101.284	101.047	101.257
5	101.450	101.473	101.183	101.352	101.614	101.283	100.991	101.296	101.532	101.353	101.087	101.324
6	102.103	102.076	102.032	102.561	102.000	102.414	101.512	102.025	102.332	102.038	101.715	102.028
7	102.542	102.522	102.298	102.54	102.561	102.414	101.903	102.440	102.773	102.468	102.100	102.447
8	102.792	102.746	102.160	102.666	102.164	102.092	102.092	102.618	103.006	102.695	102.226	102.642
9	102.747	102.226	102.588	102.226	101.974	102.465	101.974	102.481	102.897	102.606	102.534	102.534
10	103.319	103.289	102.659	103.069	102.928	102.368	102.192	102.943	103.426	103.108	103.016	103.016
11	102.788	102.809	102.471	102.609	103.274	102.676	102.531	102.698	103.006	102.742	102.697	102.697
12	103.269	103.283	102.904	103.152	103.827	103.166	103.192	103.175	103.548	103.225	103.162	103.162
1931												
13	104.109	104.132	103.790	104.010	104.140	103.424	103.424	103.775	104.136	103.607	104.108	104.108
14	104.194	104.103	103.850	104.049	104.418	103.619	103.619	104.476	104.566	104.260	104.262	104.262
15	103.372	103.228	103.229	103.210	104.467	103.074	103.074	104.151	103.919	103.447	103.473	103.473
16	103.805	103.664	103.388	103.619	103.665	103.716	103.052	104.151	104.363	103.869	103.865	103.865
17	104.619	104.534	104.138	104.31	104.826	104.331	104.145	104.934	105.223	104.683	104.682	104.682
18	105.271	105.172	104.668	105.037	105.357	104.528	104.528	105.391	105.814	105.230	105.214	105.214
19	105.756	105.661	105.953	106.640	105.616	105.289	104.892	105.716	106.198	105.639	105.586	105.586
20	107.331	107.297	107.044	107.044	107.045	106.945	106.945	107.553	107.851	106.474	107.299	107.299
21	111.254	110.860	110.574	110.899	114.339	113.130	113.130	112.910	112.910	111.952	112.422	112.422
22	114.207	113.459	113.174	113.613	114.566	117.965	117.540	116.312	112.910	115.357	115.794	115.794
23	113.770	112.728	112.603	113.033	118.416	118.653	118.561	117.974	115.712	115.582	115.850	115.850
24	117.423	115.031	116.460	118.460	124.150	124.523	124.728	124.567	120.37	120.177	120.424	120.513
25	117.511	115.864	116.233	116.536	124.578	124.523	124.728	124.567	120.37	120.177	120.568	120.568
1932												
26	117.476	115.669	115.744	116.279	124.599	124.307	124.627	124.601	121.044	120.430	119.945	124.044
27	115.606	113.793	113.685	114.295	124.257	124.307	124.147	124.237	120.842	119.988	120.258	123.658
28	116.949	115.316	115.516	115.928	121.416	121.536	120.942	121.298	118.411	117.665	117.314	123.176
29	116.515	115.038	115.380	115.644	123.594	123.716	123.052	123.454	120.271	119.516	117.798	124.228
30	116.826	115.235	115.760	115.940	122.597	122.800	122.013	122.470	119.556	118.919	119.057	119.515
31	117.576	115.789	116.510	116.625	123.119	123.565	122.583	123.089	119.972	119.400	119.171	119.515
32	117.325	116.231	116.236	117.216	124.766	125.244	124.269	124.760	122.234	120.516	120.389	120.692
33	117.804	116.231	117.138	116.82	125.294	125.743	125.825	124.252	122.234	121.487	121.481	121.734
34	117.325	115.744	116.851	116.826	125.826	125.826	124.972	125.364	121.310	120.555	120.804	120.823
35	118.211	116.607	118.003	126.331	126.849	126.085	126.085	122.422	121.108	122.297	121.648	121.624
36	119.310	116.665	118.097	117.940	128.772	128.304	128.562	128.879	123.991	122.956	123.283	123.410
37	119.675	117.075	118.561	116.437	128.950	128.117	128.549	128.962	124.130	123.026	123.320	123.692
38	119.675	117.075	118.307	116.437	125.473	130.190	129.300	129.655	124.574	123.633	123.951	124.044
1933												
39	115.426	116.901	118.211	128.202	129.697	128.736	129.105	124.154	123.299	123.521	123.658	123.658
40	119.038	116.623	117.996	128.086	129.039	128.161	128.467	123.620	122.831	123.038	123.176	123.176
41	120.097	117.584	117.013	116.898	129.326	130.144	129.203	129.558	124.712	123.864	124.108	124.228
42	122.457	119.274	120.956	133.188	133.861	132.977	133.342	127.822	126.568	127.057	127.149	124.228
43	122.537	119.103	121.029	120.890	134.408	134.179	133.200	133.596	127.972	126.641	127.243	127.243
44	125.609	121.271	123.691	136.101	138.798	137.619	133.199	130.034	131.895	130.665	130.841	130.841
45	125.729	121.212	123.784	123.523	139.411	138.232	138.766	131.895	132.191	131.008	131.170	131.170
46	129.290	124.017	123.575	138.654	144.201	139.992	143.769	138.321	132.191	133.311	135.505	135.673
47	129.301	123.976	127.129	126.802	144.086	144.933	143.744	144.255	136.693	134.455	136.437	135.526

No.	Year	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
47		130.198	124.581	127.725	127.501	145.192	145.862	144.473	145.176	137.695	135.222	136.099	136.339
48		125.246	124.189	127.013	126.816	143.418	143.912	142.510	143.280	136.332	136.332	136.742	136.048
49		130.729	125.410	126.443	128.194	145.708	146.292	144.943	145.648	138.219	135.351	136.693	136.724
50		131.482	126.924	132.392	131.933	151.093	151.544	150.185	150.941	142.787	140.234	141.288	141.437
51		135.456	129.777	133.390	132.874	152.267	152.627	151.221	152.038	143.861	141.202	142.106	142.456
52		135.627	130.032	133.605	133.088	152.258	152.531	151.047	151.945	143.942	142.510	142.326	142.517
53	1934	136.683	131.131	134.817	134.210	154.318	153.890	152.351	153.313	145.191	143.234	143.584	143.762
54		137.397	131.879	135.467	134.914	154.318	154.589	153.155	154.020	145.857	143.234	144.311	144.467
55		138.221	132.657	136.243	135.707	155.378	155.677	154.338	155.131	146.799	144.167	145.291	145.419
56		138.040	132.211	135.925	135.393	155.453	155.685	154.560	155.299	146.746	144.049	145.243	145.846
57		136.270	132.283	136.144	135.566	156.251	156.792	155.493	156.178	147.260	144.538	145.818	145.872
58		136.143	132.102	136.121	135.455	156.508	157.093	155.744	156.648	147.325	144.598	145.922	145.952
59		137.068	131.233	135.145	134.482	154.935	155.373	153.962	154.756	146.002	143.303	144.553	144.619
60		137.231	131.438	135.384	134.718	155.628	155.922	154.574	155.508	146.180	143.680	144.979	145.013
61		137.456	131.529	135.458	134.814	155.607	156.210	154.930	155.582	146.531	143.870	145.194	145.198
62		137.701	131.698	135.623	135.007	155.963	156.656	155.437	156.019	146.832	144.177	145.536	145.513
63		139.245	133.097	137.133	136.492	158.161	159.025	157.914	158.367	148.703	146.061	147.624	147.429
64		135.372	133.383	137.698	136.818	157.795	158.858	157.985	158.213	148.583	146.121	147.842	147.516
65	1935	138.759	132.868	136.992	136.207	156.675	157.749	156.925	157.116	147.717	145.308	146.959	144.661
66		139.636	133.665	137.848	137.050	157.672	158.698	157.846	158.072	148.654	146.182	147.847	147.561
67		139.867	133.923	138.123	137.304	157.850	158.795	157.895	158.180	148.859	146.359	148.009	147.742
68		139.204	133.776	138.029	137.170	157.695	158.560	157.609	157.955	148.699	146.168	147.819	147.562
69		139.467	133.535	137.753	136.919	158.399	158.328	157.399	157.709	148.433	145.931	147.576	147.814
70		139.865	133.847	138.184	137.299	158.036	158.931	157.939	158.102	148.950	146.389	148.061	147.800
71		139.852	133.872	138.440	137.388	158.305	158.874	157.627	158.269	149.079	146.373	148.034	147.828
72		139.671	133.811	138.388	137.324	158.202	158.765	157.520	158.165	148.990	146.288	147.954	147.744
73		140.373	134.431	139.100	137.968	156.946	159.362	158.007	158.772	149.659	146.897	148.554	148.376
74		140.016	134.800	139.395	138.337	159.306	159.826	158.558	159.230	150.061	147.313	148.976	148.784
75		140.706	134.726	139.290	138.241	159.107	159.646	158.372	159.042	149.907	147.186	148.831	148.641
76		140.358	134.436	138.956	137.917	158.619	159.173	157.906	158.566	149.489	146.804	148.431	148.241
77	1936	139.151	133.315	137.767	136.745	157.142	157.666	156.392	157.066	148.146	145.491	147.079	144.906
78		138.657	133.064	137.452	136.458	156.589	157.072	155.790	156.684	147.723	145.068	146.621	146.471
79		139.938	134.094	138.534	137.522	157.885	158.362	157.070	157.772	146.912	146.228	147.602	147.647
80		140.106	134.226	138.350	137.561	157.766	158.222	156.872	157.620	148.936	146.222	147.611	147.590
81		138.738	133.063	135.478	135.760	154.058	154.395	152.641	153.698	146.398	143.729	144.059	144.729
82		111.136	107.463	107.404	108.668	119.366	119.791	117.415	118.857	115.251	113.627	112.409	113.762
83		111.353	107.627	107.446	108.809	119.497	119.917	117.494	118.969	115.425	113.772	112.470	113.389
84		110.989	107.205	107.003	108.192	119.015	119.650	117.027	118.497	115.002	113.127	112.015	113.448
85		110.747	106.954	106.737	108.146	118.707	119.151	116.736	118.198	114.727	113.053	111.737	113.172
86		110.365	106.588	106.357	107.770	118.301	118.750	116.332	117.794	114.133	112.669	111.244	112.782
87		110.445	106.683	106.434	107.854	118.336	118.815	116.377	117.843	114.392	112.749	111.405	112.849
88		110.618	106.900	106.595	108.038	118.274	118.763	116.268	117.769	114.646	112.832	111.432	112.903
89		110.732	107.040	106.702	108.158	118.250	118.729	116.210	117.730	114.491	112.884	111.456	112.944
90	1937	110.881	107.189	106.850	108.306	118.378	118.864	116.326	117.856	114.629	113.026	111.588	113.081
91		113.379	109.923	109.336	110.879	119.968	120.664	117.750	119.461	116.673	115.294	113.543	115.170
92		113.658	110.199	109.464	111.107	120.008	120.712	117.763	119.494	116.833	115.455	113.614	115.301
93		115.031	111.644	110.778	112.484	121.072	121.897	118.808	120.592	118.051	116.770	114.793	116.538
94		116.543	113.227	112.238	114.003	122.286	123.185	119.972	121.814	119.414	118.206	116.105	117.909
95		116.539	113.218	112.250	114.002	122.328	123.167	119.965	121.820	119.433	118.193	116.107	117.911
96		116.922	113.611	112.630	114.388	122.849	123.658	120.509	122.338	119.685	118.635	116.569	118.263
97		117.158	113.876	112.842	114.626	122.879	123.726	120.510	122.372	120.018	118.801	117.672	118.449
98		117.929	114.737	113.658	115.441	123.565	124.391	121.095	123.017	120.747	119.564	117.377	119.229

	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
99	118.742	115.679	114.516	116.312	124.122	125.072	121.527	123.574	121.432	120.376	118.022	119.943
100	118.798	115.726	114.623	116.382	124.211	125.249	121.523	123.661	121.504	120.488	118.073	120.022
101	120.599	117.655	116.443	118.232	125.503	126.609	122.427	124.846	123.051	122.132	119.435	121.539
102	121.762	118.785	117.979	118.509	127.361	128.181	123.541	126.361	124.562	123.483	120.760	122.936
103	122.224	119.262	118.545	120.010	127.959	128.827	124.081	126.956	125.091	124.045	121.313	123.483
104	123.186	120.206	119.703	121.032	128.332	130.098	125.134	128.188	126.259	125.152	121.418	124.610
105	122.689	119.728	119.128	120.515	128.758	129.68	124.780	127.743	125.724	124.709	121.954	124.129
106	123.898	120.896	120.468	121.754	130.339	131.162	126.101	129.201	127.118	126.029	123.285	125.477
107	124.462	121.497	121.112	122.357	131.126	131.924	126.832	129.961	127.794	126.711	123.772	126.159
108	125.555	121.582	121.191	122.441	131.324	132.193	127.147	130.221	127.939	126.887	124.169	126.232
109	124.327	121.348	120.943	122.206	131.064	131.992	126.939	129.998	127.696	126.670	123.941	126.102
110	124.604	121.626	121.306	122.512	131.455	132.280	127.222	130.319	128.029	125.953	124.264	126.415
111	124.371	121.410	121.075	122.285	131.156	131.995	126.962	130.038	127.763	126.702	124.018	126.141
112	123.849	120.849	120.516	121.738	130.771	131.614	126.627	129.671	127.310	126.232	123.672	125.704
113	123.826	120.864	120.468	121.719	130.575	131.399	126.381	129.452	127.200	126.132	123.425	125.585
114	124.713	121.723	121.794	122.743	132.254	132.665	128.285	130.735	128.484	127.194	124.540	124.739
115	125.862	122.828	123.596	124.095	134.562	134.552	128.424	132.513	130.212	128.690	126.010	128.304
116	125.255	126.048	128.497	127.934	140.912	139.341	131.782	137.345	135.084	132.694	130.139	132.639

1938 — 1939

	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
EGYPT	1.53971	1.01742	1.44035	1.33516	0.850640	0.935115	0.841119	0.875625	1.19518	0.976269	1.14473	1.10539
S.AFRICA	0.509411	0.556350	0.697595	0.587785	1.06949	1.55382	1.67697	1.43343	0.789450	1.05209	1.18728	1.01061
CANADA	3.00932	1.17055	1.44635	1.87607	4.58732	4.09407	4.38175	4.35438	3.79832	2.63231	2.91505	3.11522
U.S.A.	9.75682	6.46693	8.03632	8.08669	14.0907	11.6907	11.9888	12.5901	11.9238	9.07882	10.0126	10.3384
BRAZIL	1.18361	1.17055	1.18038	1.17818	1.63581	1.50115	1.71518	1.64405	1.40971	1.37585	1.44778	1.41111
ARGENTINA	2.58507	3.47421	3.41181	3.15703	3.26447	2.65981	2.49703	2.80710	2.92477	3.06701	2.95442	2.98206
INDIA	1.81423	1.38152	1.81331	1.66969	1.99588	3.65256	3.56013	3.73619	2.90505	2.51704	2.48672	2.70294
JAPAN	1.96000	1.11270	1.72782	1.60018	3.59739	3.69363	3.10915	3.46672	2.77870	2.40316	2.41849	2.53345
CHINA	1.07943	1.03614	1.76015	1.29191	2.30011	1.56286	0.965565	1.60951	1.68977	1.29950	1.36286	1.45071
RUSSIA	2.276492	0.614196	1.59850	0.829728	1.41413	1.56060	1.44731	1.47401	0.845313	1.08740	1.52291	1.15187
AUSTRIA	2.85959	2.68647	2.47857	2.67488	1.09632	0.940402	1.00204	1.01292	1.01795	1.81344	1.74031	1.84190
BELGIUM-LUX.	3.04338	3.08970	4.22722	3.45343	3.19230	3.68428	4.49616	3.85758	3.11784	3.48699	4.36169	3.65551
CZECHOSLOVAKIA	3.19866	3.22431	3.77677	3.39985	1.86000	1.58653	1.54981	1.65538	2.52933	2.40522	2.66329	2.53261
FRANCE	14.3043	15.3719	13.4324	14.3695	8.87230	10.1626	8.20143	9.07879	12.7673	12.7673	10.8169	1.7242
GERMANY	21.0527	26.3083	21.1893	23.1434	10.2727	9.16249	9.08251	9.77257	16.0627	17.7754	15.5359	14.4580
ITALY	7.22790	9.09555	7.88617	8.08654	3.07538	2.78346	2.46404	2.77429	5.17664	5.93950	5.17510	5.43042
NETHERLANDS	3.19669	3.78045	5.50459	4.16058	4.70516	4.98879	5.30379	4.59925	3.95092	4.38462	5.40419	1.90145
SWEDEN	0.941182	1.59249	2.24294	3.59220	1.58399	2.25204	2.79725	2.21109	1.26259	1.92226	2.52009	1.47378
DENMARK	0.950687	1.17055	1.18038	1.10054	1.63865	1.84236	2.05973	1.84692	1.29467	1.50645	1.62005	1.47378
FINLAND	0.155280	0.345379	0.547445	0.349368	0.818545	0.826450	1.08267	0.909221	0.486912	0.585914	0.615057	0.629294
NORWAY	0.371165	0.345379	0.847746	0.521430	0.796639	1.13295	1.41608	1.11522	0.583902	0.739164	1.13191	0.818326
POLAND	1.72708	1.86130	1.81331	1.80057	1.14786	1.04990	1.28555	1.16410	1.43747	1.45560	1.54943	1.48083
SPAIN	3.06597	2.55206	0.332632	1.98355	1.59837	1.35946	0.648900	1.20241	2.32217	1.55601	0.490766	1.59298
IRELAND	0.138246	0.134409	0.	0.0908848	0.953096	0.920743	0.942229	0.938689	0.545671	0.527576	0.471114	0.514787
AUSTRALIA	1.55477	1.03614	1.18038	1.25710	2.47524	2.66295	2.97259	2.70359	2.01501	1.84954	2.07648	1.98034
NEW ZEALAND	0.155280	0.	0.182482	0.112587	0.894487	1.06261	1.35579	1.09763	0.524883	0.531304	0.759132	0.605108
U.K.	11.1389	8.97986	9.54001	9.88626	17.7495	18.7809	19.7173	18.7493	14.4442	13.8004	14.6287	14.3176
MEXICO	0.354131	0.345379	0.515114	0.404875	0.463415	1.61642	0.659126	0.912987	0.408773	0.980900	0.587120	0.658931

#	K13	K14	K15	K16	K17	K18	K19	K20	S13	S14	S15	S16	S17	S18
1	100.757	96.7035	100.659	100.082	100.237	97.8806	100.422		100.429	94.9699	100.541	100.265	99.6309	95.6360
2	101.092	94.9878	100.990	100.405	100.132	96.3044	100.614		100.841	93.2243	100.990	100.126	99.9622	93.3947
3	101.347	93.3804	101.266	99.9052	100.009	94.4345	99.8517		100.835	91.5482	101.079	99.2003	99.7634	91.9132
4	101.148	92.9504	101.096	99.4958	100.009	94.2411	99.5576		100.650	90.8607	100.966	98.2588	99.6683	91.1359
5	101.326	91.7712	101.273	99.3546	99.8366	92.7573	99.2614		100.699	90.9531	101.251	97.8751	99.7166	89.2293
6	101.974	90.3143	101.839	99.5912	99.7840	90.6108	93.0206		101.351	90.1815	102.135	97.8135	99.6735	88.0870
7	102.235	89.2679	100.240	100.240	99.8193	85.6071	93.7706		102.043	87.3680	102.127	98.3109	99.5360	86.7749
8	102.495	88.7421	101.991	99.3430	99.5437	85.9571	93.4883		102.216	86.4503	101.843	98.2405	99.4717	85.4961
9	102.373	87.6245	101.972	99.3430	99.7643	87.2660	98.7932		102.236	84.9034	101.893	97.7664	99.5834	83.6948
10	102.831	86.0325	101.859	98.3968	99.7643	87.2860	98.4107		102.565	83.4162	102.269	96.9899	99.6187	82.4790
11	102.660	84.6303	102.277	97.1050	99.7445	85.8071	97.7086		102.565	82.2154	102.335	96.3417	99.6407	80.4899
12	102.190	83.1174	102.236	95.8291	99.6963	83.8535	97.7086		102.624	82.2154	102.335	95.1721	99.6767	79.2650
13	104.754	82.0650	102.654	94.5134	99.7056	81.9285	95.5568		103.224	80.7283	102.852	95.1721	99.7774	77.6646
14	105.603	81.5410	104.138	93.4320	99.7649	76.6631	94.4516		104.763	79.6497	104.254	94.1314	99.7418	77.2621
15	104.951	81.0982	104.884	93.6951	92.8246	79.7587	94.9481		105.630	79.4591	104.912	93.6802	99.7733	76.8561
16	105.365	80.3192	104.082	92.7584	99.7717	79.0506	93.4354		105.140	79.1828	104.020	92.8594	99.7873	76.2912
17	106.285	79.2804	104.319	91.3719	94.9503	78.2606	92.6452		105.709	78.6441	104.182	91.7057	99.7377	75.0338
18	106.187	78.0113	104.943	90.6420	99.5030	76.8497	91.6815		105.768	77.6917	104.661	91.2512	99.7486	74.6112
19	106.310	78.0113	105.105	90.0424	99.5858	76.0234	91.2982		106.308	77.1171	104.846	90.7816	99.7311	73.6763
20	107.254	77.4601	105.040	89.8184	99.7946	75.5169	91.2723		106.635	76.4872	104.881	90.9318	99.7619	72.5581
21	102.929	76.4582	105.559	89.8972	99.7946	74.2849	90.6846	81.7821	107.088	75.5641	105.394	89.9825	103.293	72.0060
22	92.6965	76.7883	107.233	89.7410	93.5862	73.3387	89.3098	80.1327	111.523	75.1314	108.958	89.5755	109.018	72.3216
23	99.5127	76.3723	91.5727	88.7900	91.8625	72.5559	89.5470	78.8113	116.726	75.5914	116.978	88.9268	112.018	72.3216
24	84.3329	75.9590	88.1824	88.1824	78.4911	72.2212	87.5194	75.7902	120.247	75.3616	119.275	88.4764	114.196	72.3614
25	85.6331	75.0132	83.6135	87.6048	72.6358	70.6436	86.7114	73.5246	124.926	75.3616	126.069	88.2981	121.561	72.2461
26	86.1232	74.8275	84.4582	86.9204	73.1895	69.7367	85.6721	74.3368	127.438	76.6253	124.843	87.5036	119.563	71.3123
27	88.9651	74.4331	84.4419	87.2753	73.2385	69.3524	84.7620	74.2920	127.270	75.1163	123.680	87.3196	115.171	71.6670
28	91.2503	73.6430	87.1248	86.2791	76.4532	69.0417	84.2512	73.2920	125.109	74.4539	120.707	86.5299	115.919	70.9660
29	90.1920	72.6720	89.5253	84.9574	78.6502	68.3543	83.2956	73.1958	123.460	75.3440	119.579	85.6356	113.259	69.7476
30	89.3733	72.6262	88.8262	84.4409	78.4541	67.5115	83.2959	72.8163	124.469	72.2633	120.997	85.2600	114.690	68.6735
31	85.7072	71.5508	88.5041	84.2664	77.3655	66.4931	82.2976	70.9822	125.599	70.3642	121.903	85.3108	115.838	67.9887
32	87.5316	71.9191	87.1272	83.8239	75.3840	66.4116	82.2103	71.0951	126.127	70.9735	123.681	84.8125	117.106	67.4432
33	87.3030	72.1757	85.4950	83.6223	75.3749	66.4116	81.7532	71.591	129.327	71.5305	124.703	84.4465	117.964	67.8466
34	86.1017	71.6117	85.3837	83.7165	73.0699	66.3878	81.0056	71.591	131.588	72.1659	124.409	84.6983	117.022	68.3964
35	84.4339	71.3522	84.1958	83.6759	71.3274	66.2042	81.7426	71.7992	131.775	71.4021	124.683	84.6423	117.624	67.1675
36	84.4050	70.5236	82.3099	83.5689	69.5503	65.4079	81.5718	71.3460	135.819	71.4955	126.221	84.53390	121.064	67.1371
37	86.9699	69.7823	82.2967	83.4916	69.4677	65.5552	81.2762	71.1896	135.144	71.5598	128.648	84.2593	121.444	65.5693
38	85.7699	69.2845	84.8522	83.4761	71.3611	64.2727	80.3332	67.1742	135.199	7.7143	127.628	83.7102	119.691	65.3517
39	85.9264	67.7690	86.4844	83.5274	71.3381	63.2699	79.6776	67.7038	135.199	70.0772	127.691	83.4060	120.330	65.5924
40	89.5430	68.7813	85.9784	83.1269	73.6749	63.1626	79.3443	67.6456	134.418	69.4303	127.242	83.7217	120.099	65.2226
41	91.2250	62.7444	87.6060	82.7344	74.6250	63.2098	78.7226	68.4308	130.949	69.5879	124.057	82.1710	117.446	65.7212
42	92.3336	90.9694	82.2654	83.1249	78.6292	64.4703	78.65904	70.7441	119.341	70.4395	112.538	82.2925	107.320	66.9162
43	94.6485	72.1967	90.4112	83.2710	85.6421	66.1382	78.0074	73.6663	113.617	71.4109	107.141	82.2988	102.041	66.0985
44	93.4819	72.2552	92.6560	83.3941	85.5474	68.3046	78.4873	76.0519	112.294	72.1294	96.1729	82.9539	93.5351	69.0299
45	92.9973	72.5457	91.4073	83.2340	83.5674	68.1017	80.9802	77.4894	104.256	72.1296	97.6235	83.2492	95.1092	68.5526
46	92.3939	72.6319	90.9720	82.9336	83.4655	68.3254	81.6405	78.5283	109.256	71.7830	93.5303	83.3253	90.9722	68.3975
47		72.6319	90.9330	82.9961	83.7625	64.3348	81.7375	79.0035	99.2943	71.4646	92.8773	83.7183	90.7840	57.8346

	K13	K14	K15	K16	K17	K18	K19	K20	S13	S14	S15	S16	S17	S18
47 ·	96.1828	72.8398	94.2089	82.6475	89.1595	88.7776	82.1314	77.5653	92.2775	71.5456	86.1714	83.8589	66.1186	
48 ·	97.3759	73.3589	94.4973	82.3427	80.6163	81.8652	81.7842	74.6315	91.2143	71.9977	87.3405	83.5264	63.4776	
49 ·	95.4897	74.1624	94.5963	81.7637	89.4523	89.7646	81.8294	74.1042	92.3413		86.1214	83.2687	69.6075	
50 ·	97.0033	74.5163	95.2319	81.6214	86.9792	89.7546	81.8294	77.1132	93.3266	73.0987	87.1179	83.1481	70.5555	
51 ·	97.4416	74.2685	95.7522	86.5784	79.2776	82.2426	82.2482	72.7212	86.0996	82.6651	83.5229	69.6046		
52 ·	98.3073	73.9218	96.6538	81.1741	87.4928	81.9336	78.8877	92.2482	86.0996	82.6651	83.5229	69.6046		
53 ·	98.3087	73.9271	96.7295	83.3265	79.2776	81.4643	75.0690	91.5435	72.2965	85.4587	82.2175	68.8885		
54 ·	97.3406	74.2820	95.7415	47.5264	69.5508	80.2990	92.1303	72.2846	81.9428	84.1765	68.8715			
55 (1934) ·	97.9706	74.4721	95.4882	86.2440	70.0238	80.1827	92.7518	72.4835	86.6086	82.4098	84.3275	69.0399		
56 ·	96.9107	75.3271	94.5504	86.1128	70.7142	81.3445	92.7031	72.7457	86.5701	83.0065	84.2555	69.1196		
57 ·	95.8257	75.5390	93.6048	84.7511	70.8522	81.7765	91.9569	73.4013	85.7601	83.6003	83.5522	68.4673		
58 ·	95.4917	75.1450	93.3063	84.161E	82.3329	78.2646	92.4422	73.0911	83.1222	83.6906	69.6534	69.0236		
59 ·	96.5528	75.0156	94.3245	82.2494	82.3566	79.5433	93.6321	72.6073	83.9382	83.7723	69.5311	68.3971		
60 ·	96.3652	74.8897	93.9663	85.1074	70.0137	82.1591	77.5769	73.2913	72.6735	86.7088	83.6123	68.3254		
61 ·	95.7771	75.6330	93.3264	84.0213	71.8477	81.8268	75.9761	93.8165	72.7097	87.1960	83.3348	68.3284		
62 ·	95.2319	75.4325	92.8249	83.7070	70.9425	81.8896	76.4213	94.3012	73.0605	87.5747	83.0361	68.7637		
63 ·	94.2111	74.9116	91.7000	82.2438	70.5229	81.9536	76.5498	94.3018	72.9801	87.8658	82.7343	68.9.91		
64 ·	95.7802	75.4681	93.1994	85.5639	71.9933	81.4855	77.8155	95.5252	72.4154	88.8253	82.2015	68.6113		
65 ·	96.5947	75.3421	93.7110	82.4641	71.8246	82.2556	94.9913	72.9933	89.1069	82.3863	68.5490			
66 ·	97.0662	75.7541	82.7872	84.4516	72.2822	81.7828	94.8257	75.5152	89.3724	82.6595	69.4431			
67 ·	97.3632	75.6731	82.4464	81.1926	71.7309	80.2556	94.2261	73.2944	87.8839	82.4752	68.9900			
68 ·	97.3632	75.6731	84.3118	81.7309	71.7309	80.2556	94.2261	73.2944	87.8839	83.1842	69.5336			
69 ·	97.5638	76.2621	94.5372	37.5614	72.5948	81.6311	92.0973	94.1128	73.5612	83.8302	67.4414			
58 ·	97.1674	76.6600	83.8079	72.9748	81.5639	82.0972	94.5944	73.2631	87.8730	83.4207	69.2510			
71 ·	96.7487	75.6660	84.5001	72.6820	82.2274	83.3085	74.4033	75.5 12	87.7924	84.0031	68.4164			
72 ·	97.3426	77.8299	93.8749	87.0264	72.7667	83.5662	75.2217	88.8479	37.3453	71.5369				
73 ·	97.4299	78.0463	94.4577	87.2943	73.4334	82.6973	95.5656	75.8271	89.3067	84.5947	71.8321			
75 ·	97.4299	78.0463	94.4989	86.3661	71.5927	82.2739	80.4516	95.5493	76.2303	89.3067	84.9493	71.6721		
74 ·	97.6494	78.0317	94.7371	86.0723	87.5737	83.6898	94.5471	76.2303	89.2785	85.0430	71.6906			
74 ·	97.7161	78.0382	94.8987	87.5375	73.5953	83.2678	76.4213	94.486	89.1838	85.0299	72.0133			
75 ·	97.6207	77.9695	94.7534	37.0667	73.1581	79.7184	76.4136	75.5228	88.1615	84.8495	72.0416			
75 ·	97.4956	77.9395	94.6048	97.7111	73.4253	82.7741	94.8933	75.5228	88.6048	84.4932	72.0223			
72 ·	97.7777	77.5844	94.8984	87.4593	72.2255	80.1742	81.9777	75.5259	88.0751	84.4506	71.1737			
73 ·	96.3321	77.8188	95.6864	87.5684	72.2296	82.9368	83.0930	74.0216	76.3574	88.8108	84.5623	71.5340		
79 ·	98.3215	78.9262	95.4725	18.7957	73.2406	82.6259	84.2323	74.5396	79.5206	88.3327	84.5623	71.5040		
80 ·	98.3488	79.8221	95.4831	35.7128	74.7559	83.7486	85.5762	74.2759	79.9937	88.1657	84.0405	73.4434		
81 ·	98.5682	80.1222	98.3174	39.2251	75.9612	84.2315	85.7526	75.1376	88.2055	85.7048	74.4311			
82 ·	100.913	81.5940	87.6503	89.5502	73.3367	84.4956	85.9933	95.2628	88.4246	85.2818	76.5435			
83 ·	100.741	82.5418	87.1547	88.5659	75.101	84.3567	97.6965	103.995	89.5615	86.0405	75.1643			
84 ·	100.619	84.2457	88.1547	83.4010	71.918	86.0769	97.4784	103.741	94.3219	87.2865	79.5531			
85 (1937) ·	100.30E	95.7357	88.1743	93.0386	84.6744	87.4784	101.944	94.3283	87.6837	82.5528				
85 ·	100.161	95.8518	97.6519	92.8394	85.1803	85.4627	102.242	93.3960	94.4986	88.1046	84.3526			
87 ·	99.9441	89.4887	89.1477	92.4553	89.1859	86.534.7	102.937	93.3140	94.4986	88.5823	93.1495			
88 ·	100.563	89.3544	98.8308	97.5436	89.5572	102.719	91.6791	89.8183	95.0026					
89 ·	100.821	89.3245	98.4249	93.8721	97.9698	89.2130	89.6699	102.719	90.5652	94.5210	89.4116	95.7442		
90 ·	100.753	89.4590	98.4277	94.1370	97.3534	89.6324	91.7109	102.664	94.3030	89.6727	93.3072			
91 ·	102.521	89.6590	98.0059	94.1591	97.3441	91.9056	102.377	94.4666	90.5891	93.7879				
91 ·	102.521	90.4577	100.125	94.0668	97.1217	90.8157	92.9505	103.951	95.2211	91.0599	93.3150			
92 ·	102.634	90.5878	100.373	97.6596	88.9547	51.1552	93.5161	91.3222	91.6663	95.2900				

	K13	K14	K15	K16	K17	K18	K19	K20	S13	S14	S15	S16	S17	S18
93	102.885	90.8227	100.623	93.0977	98.1756	89.2465	91.9757	94.2132	103.753	91.4584	96.3184	92.7794	96.3908	97.9069
94	103.731	90.3693	101.215	93.1400	99.2549	93.2967	92.2965	93.4791	104.523	91.1161	96.8547	93.1956	97.1589	96.9471
95	104.162	89.3281	101.594	94.7422	99.2522	96.5676	92.4274	90.1624	113.434	96.0055	96.2441	93.9989	96.5665	96.4552
96	104.414	88.8321	101.691	95.1449	99.5172	95.9326	92.4619	96.1330	105.703	89.9349	96.2436	94.1821	96.5322	96.8547
97	104.437	88.7242	101.917	94.1912	99.9124	96.0270	92.3394	92.7167	105.709	90.2205	96.3985	93.7334	96.8517	97.3920
98	105.423	89.1052	102.962	94.3436	100.500	95.2297	92.2729	92.5214	105.386	89.7377	96.3253	93.8543	96.9266	86.5525
99	105.922	97.6827	103.486	93.8113	101.400	94.8559	92.0915	82.2345	106.726	89.1457	97.6759	93.3124	98.1913	85.6651
100	106.161	97.2712	103.756	93.6728	101.154	94.4118	91.9865	82.5394	106.929	95.7536	97.9337	93.4521	98.4490	85.2441
101	107.165	86.9502	104.839	93.2845	102.835	93.7649	91.9906	82.7791	108.653	88.2516	99.9194	93.2170	105.462	84.1957
102 1938	108.019	87.0820	105.764	93.9522	103.489	93.8999	92.3141	82.5597	110.961	86.3924	101.463	94.0568	100.747	84.0591
103	107.755	87.2324	105.512	94.3685	102.564	93.4927	92.1210	82.5931	110.632	88.3253	101.984	93.8440	100.942	83.2789
104	107.590	86.7710	105.407	94.3201	101.937	82.3461	91.6456	84.2725	111.336	87.0322	103.282	93.7624	101.535	81.6832
105	106.773	86.6578	104.606	93.8820	106.752	82.1341	92.0632	85.7130	113.499	87.3526	104.146	93.6404	102.570	81.1114
106	106.585	86.8914	104.469	94.1340	100.196	92.0254	92.3866	85.3969	114.123	87.7224	105.112	94.0118	103.055	81.3012
107	106.438	86.8389	104.370	94.2655	99.1983	91.9497	92.6025	86.4464	115.062	87.5214	106.003	94.1930	103.699	81.3603
108	106.041	86.9223	103.997	94.0068	98.4377	91.9645	92.6944	85.5293	115.463	87.829	106.315	93.9697	104.164	81.2230
109	105.934	86.9731	103.852	94.1592	98.4251	91.5469	92.7246		115.716	87.7102	106.226	94.1888	104.041	81.1347
110	106.150	87.0767	104.111	94.3116	98.6716	91.7421	92.5183		114.557	88.0937	106.152	94.0048	103.791	80.2260
111	106.149	87.2138	104.110	94.5994	98.7254	91.6108	92.3560		114.237	88.337	106.140	93.9938	103.843	80.8098
112	106.348	87.0096	104.026	95.2217	98.8377	91.3226	92.2645		113.712	88.4560	106.233	94.1817	103.931	80.9453
113 1939	106.372	87.0595	103.973	95.7553	98.4866	91.6253	92.0516		113.743	88.3363	106.134	94.3356	103.736	81.4395
114	107.190	87.1576	104.776	96.3910	98.5366	91.1970	91.7614		114.158	89.1773	107.540	94.9396	103.720	81.2287
115	108.293	87.0936	105.842	97.7194	98.4972	90.7980	92.1445		116.170	89.6229	109.847	95.4406	103.797	80.6033
116	110.245	87.0905	107.979	98.9013	97.3329	90.4946	91.7920		121.611	89.2829	116.124	95.9343	104.645	80.7576

	S19	S20	C13	C14	C15	C16	C17	C18	C19	C20	F13	F14	F15	F16
1	101.277		99.5475	96.7661	99.5695	99.0254	99.5139	106.232			100.559	95.9197	105.684	98.3760
2	101.221		100.233	95.8767	100.283	99.3300	99.9752	95.6310	93.9018		105.917	94.0308	100.716	93.8904
3	100.049		100.753	93.4967	100.794	98.3812	100.477	93.9513	98.7398		100.999	92.3636	100.821	98.8320
4	99.8905		100.879	92.9517	100.936	97.5499	100.624	93.4793	97.8023		100.941	91.8533	100.917	97.7293
5 1930	99.4312		100.975	91.5732	101.029	95.9293	100.549	91.9571	97.0547		101.276	90.6355	101.130	97.2480
6	99.1613		101.533	89.8464	101.595	95.6299	100.699	92.9114	96.6327		102.077	89.1797	101.818	97.0967
7	98.4916		101.634	88.3625	101.802	95.7535	101.634	97.9943	96.4448		102.493	88.1408	102.277	97.335
8	98.6344		101.065	87.7359	101.571	95.6919	100.983	87.3055	96.7712		102.632	87.4556	101.364	97.3243
9	98.6502		101.795	86.6839	101.571	95.6972	100.793	86.4260	97.1374		102.564	86.0349	101.797	95.9405
10	99.3073		101.905	85.1622	101.514	95.9334	100.996	85.0147	96.5967		102.991	84.7560	102.147	95.6746
11	98.4046		101.965	93.5733	101.514	95.5573	100.996	83.1194	96.3142		102.345	83.5358	102.152	95.5746
12	98.3965		102.421	81.7970	100.745	94.1767	100.582	81.1143	95.0966		103.408	81.9717	102.611	94.0462
13	98.3915		102.753	80.5210	101.345	97.085	102.791	74.7235	92.6932		104.541	90.5384	103.566	96.7902
14	94.8631		103.442	79.8577	101.545	91.5139	100.742	79.1567	91.9203		105.185	80.1892	104.098	93.4493
15	94.0033		103.095	79.3940	101.545	91.930	100.7?8	77.2618	91.7599		104.327	79.8861	103.577	91.1918
16	92.7938		103.332	79.5932		99.6632	100.466	75.5924	90.1294		104.819	79.1364	103.286	90.1143
17	92.2014		103.742	79.1957							107.619	73.0134	103.739	89.5747
18 1931	91.7717		103.440	76.4253		99.1878	100.446	74.5145	89.2767		105.596	77.3999	103.969	89.0077
19	92.2105		103.569	75.5958		90.0378	100.507	74.1973	89.6232		105.868	76.7647	103.037	77.395
20	90.6630		104.022	75.3716		89.6635	100.381	73.3471	83.7340		106.944	75.3158	104.536	85.4575
21	89.8671	87.2554	102.554	74.4352		89.1483	99.2758	73.0535	83.4149	82.9580	110.447	75.3194	105.000	88.2715
22	89.4447	87.0124	102.211	73.9146		87.7443	96.8392	73.3754	87.8218	81.9090	116.885	75.9336	114.035	87.757
23	89.0245	96.4759	102.645	75.2479		87.3523	97.6574	73.1597	87.2752	81.2794	121.166	75.3900	116.469	87.3007
24	89.2717	93.6569	95.3986	74.3001		86.3536	95.3796	72.0489	87.0932	81.4962	123.635	75.2252	122.019	89.3647

			S19	S20	C13	C14	C15	C16	C17	C18	C19	C20	F13	F14	F15	F16
25		.	88.3012	81.5165	102.088	73.5292	101.694	95.7890	97.5673	71.0323	86.0277	78.5905	123.512	74.2619	121.257	95.7655
26		.	87.6652	82.3965	104.966	73.4351	103.610	95.1306	99.6725	70.9495	85.0772	73.5566	123.606	74.2594	120.830	95.1759
27		.	86.9622	83.3410	105.792	72.8970	104.131	94.7973	100.219	70.2261	84.3058	78.6489	121.391	73.6557	118.145	94.3907
28		.	85.9944	82.2198	104.869	71.7778	103.257	93.6853	99.2076	69.1564	83.6314	77.8269	120.322	72.6325	117.50	93.5636
29		.	85.5201	82.4980	103.837	70.5820	102.431	93.1356	98.3970	67.9476	83.0133	76.5793	121.193	71.4271	116.693	93.1276
30	1932	.	85.4953	82.4000	102.533	69.3344	101.986	92.9990	96.9589	66.6696	82.7920	75.4857	121.475	70.1954	119.004	93.1330
31		.	85.1440	81.9243	104.631	69.7674	107.947	92.4711	98.4288	67.1797	82.2134	74.2791	122.907	70.2236	[illegible]	92.6942
32		.	84.7559	81.8139	106.760	70.4591	104.447	92.1684	99.8636	67.9374	81.9765	74.2564	124.233	70.9428	120.993	92.3527
33		.	85.2013	82.1282	110.242	70.9591	107.791	92.4437	103.052	68.4936	82.4308	74.7351	124.295	71.4357	120.921	92.7332
34		.	85.3053	82.2575	112.544	71.1136	105.943	92.2590	105.022	67.5163	82.2770	75.6223	125.523	70.7066	122.125	92.7349
35		.	85.2676	81.5973	102.406	69.7491	106.557	92.0552	101.776	67.2877	82.1117	75.4692	127.981	70.5160	124.131	92.6935
36		.	84.9393	79.7873	106.012	69.1792	105.025	91.5553	101.236	66.4369	81.6595	74.9154	127.514	69.7427	123.731	92.2711
37		.	84.2233	77.7614	[illegible]	68.3694	106.475	92.9500	101.086	65.5243	80.7566	73.1775	126.906	69.1532	[illegible]	81.5512
38		.	83.5805	78.3261	103.773	67.5235	102.911	90.0021	95.7219	64.4325	79.6741	73.6222	125.945	68.5258	123.140	81.0947
39		.	83.0436	79.2453	103.272	67.1845	[illegible]	79.3999	95.5121	64.1790	73.9244	73.2329	126.817	68.0719	123.207	80.3195
40		.	82.3038	80.4945	[illegible]	67.3012	[illegible]	79.2089	94.5716	64.4827	78.4682	74.3304	128.190	69.1697	124.594	79.3695
41		.	82.0629	81.9601	99.9486	68.8735	[illegible]	79.1623	92.2701	66.2363	73.5895	76.0765	131.893	69.2269	128.061	79.9936
42	1933	.	82.5658	83.3672	97.9617	70.3767	[illegible]	79.7464	92.1416	68.2483	79.3116	78.7551	132.020	70.1710	125.178	80.3687
43		.	83.1843	84.4852	94.9690	71.4778	[illegible]	80.7794	90.8063	69.9786	80.6491	81.0567	135.533	71.1693	131.423	80.9153
44		.	83.7769	84.5199	95.5247	72.0454	94.3660	81.5739	91.8679	70.1562	81.8997	82.3146	135.885	71.0005	131.606	81.4200
45		.	83.9012	85.5464	96.2163	72.5397	94.0446	82.0776	92.1892	70.7311	82.4934	84.5212	140.603	71.2255	136.143	81.6573
46		.	84.4040	86.0199	95.5491	72.5235	[illegible]	[illegible]	92.4649	70.7325	83.0590	84.5611	140.567	71.0794	136.260	82.1814
47		.	84.9716	85.5673	94.7036	72.4029	[illegible]	[illegible]	91.5505	70.5527	83.0477	82.5934	141.758	71.0262	136.941	82.0572
48		.	84.4975	83.5257	95.1160	72.6939	[illegible]	[illegible]	91.7413	70.7402	82.6524	81.4903	140.131	71.4538	135.926	81.7396
49		.	84.3293	84.2736	94.9616	73.7544	93.0347	81.9381	[illegible]	71.9418	82.4655	80.5869	142.283	72.3570	137.962	81.4397
50		.	84.3697	85.1771	94.1594	74.2570	[illegible]	81.9692	90.2986	72.5877	82.5437	82.9283	148.395	72.6927	143.931	81.3112
51		.	83.7766	85.5399	94.3332	73.9985	92.4635	81.7314	90.2449	72.2830	82.2835	85.1585	149.590	72.4136	145.166	80.9710
52		.	82.9844	86.0466	94.2695	73.5927	[illegible]	[illegible]	90.1593	71.7619	81.7136	85.3313	149.509	72.0558	145.152	80.4765
53		.	82.715	87.699	94.9213	73.7737	[illegible]	[illegible]	90.4352	71.9578	81.9246	86.2312	150.558	72.1615	145.285	80.1656
54	1934	.	83.3363	88.5951	96.1636	74.1731	94.2769	81.9497	91.5346	72.3943	82.4851	85.7019	151.115	72.5250	[illegible]	80.6655
55		.	83.6151	88.2575	96.2994	74.4647	[illegible]	82.4165	91.7962	72.6403	82.8121	84.3463	151.711	72.8613	146.496	81.2037
56		.	84.0625	86.0163	96.6747	75.5542	[illegible]	82.9560	92.5645	73.7942	83.3424	84.9162	151.477	73.7595	146.315	82.1252
57		.	84.1293	88.4689	97.5744	75.6425	[illegible]	[illegible]	93.4710	73.2062	83.9616	83.3942	152.305	73.7142	147.252	82.3319
58		.	84.4110	88.2547	97.6645	75.0559	[illegible]	83.5637	93.2224	73.5193	84.1235	84.272	152.764	73.4120	147.625	82.4836
59		.	84.2254	87.4943	97.8218	74.9359	[illegible]	83.4837	93.3431	72.9315	84.0480	83.2641	151.531	73.2370	146.404	82.4392
60		.	83.7213	85.4372	97.1874	75.1914	[illegible]	[illegible]	92.5588	[illegible]	83.6777	83.3230	152.590	73.5231	147.277	82.1314
61		.	83.3292	84.9970	96.6814	76.1679	[illegible]	[illegible]	91.5766	74.4997	83.7072	83.0537	152.943	74.0920	147.527	81.9391
62		.	82.9294	84.9256	95.4251	76.1462	[illegible]	[illegible]	91.7633	74.6001	83.6969	83.8659	153.364	73.9295	[illegible]	81.7692
63		.	82.0779	85.4370	95.6461	75.7272	[illegible]	[illegible]	91.5771	74.1179	83.1192	85.3316	[illegible]	73.5049	149.390	81.2190
64		.	82.1124	86.4795	97.2319	76.4550	[illegible]	83.2274	93.9677	75.2961	83.5603	85.8447	157.457	74.5599	152.155	81.5700
65		.	82.3992	87.6265	97.1867	76.9337	[illegible]	83.7461	93.0510	75.3466	83.5894	87.2423	156.557	75.1669	[illegible]	81.3314
66	1935	.	83.0353	88.8361	96.7631	76.7090	[illegible]	83.8211	92.7165	75.4577	84.1148	86.9190	155.284	75.1927	[illegible]	82.4291
67		.	83.1344	89.0420	96.5567	76.5500	[illegible]	83.8137	92.5197	75.2055	83.9353	87.0936	156.403	75.2230	150.765	82.3490
68		.	83.1235	89.6647	[illegible]	77.1476	[illegible]	83.8205	92.4923	75.2962	83.3010	88.3312	156.420	75.6233	[illegible]	[illegible]
69		.	84.0404	90.4947	96.2625	77.8951	[illegible]	84.7250	92.1467	76.5459	84.6194	88.2136	155.348	76.2317	156.713	83.5714
70		.	84.8055	91.0325	95.9234	78.5203	[illegible]	84.9245	91.7175	77.1745	85.3178	85.8989	156.644	77.3390	151.145	84.1794

S19	S20	C13	C14	C15	C16	C17	C18	C19	C20	F13	F14	F15	F16

	F17	F18	F19	F20	B13	B14	B15	B16	B17	B18	B19	B20	H13	H14
1	100.227	96.8623	100.645		100.494	95.2955	100.409	99.7016	100.014	95.7284	100.288			95.7468
2	99.9019	94.9222	101.043		93.898	93.6027	100.811	99.2162	100.082	94.1786	100.568			94.0579
3	99.7812	93.1156	99.6760		91.882	101.039	98.5788	98.5788	100.103	99.2932	100.588			92.4400
4	99.8413	92.7156	58.3907		91.3129	90.0229	100.994	97.697	100.159	98.5049	100.719			91.8995
5 1930	99.9487	91.3337	97.6837		101.185	90.0229	101.158	97.6311	100.144	96.2012	100.982			90.7160
6	100.005	89.3198	57.2440		88.7436	98.7436	101.665	97.8878	100.104	88.5945	101.499			90.2453
7	100.159	87.4631	57.3178		87.9645	87.9645	101.846	98.0076	100.152	87.2108	101.683			87.5277
8	100.664	86.5767	57.5012		87.2300	87.2300	101.740	98.0439	100.146	86.3038	101.903			87.7722
9	100.044	85.2871	57.7387		85.9700	85.9700	101.587	97.6663	99.9776	85.1922	102.27			85.3891
10	99.9549	84.1788	97.1851		84.4098	84.4098	101.947	96.9398	99.9910	83.7015	102.54			84.8731
11	100.086	82.5525	56.7765		83.0998	83.0998	101.957	96.3294	100.001	81.9067	102.193			83.6400
12	100.119	80.5289	55.4222		91.5290	95.2290	102.478	95.2237	100.121	80.0854	102.75			
13 1931	99.9930	78.9303	94.1875		80.3740	80.3740	94.1671	100.084	99.848	95.848				
14	99.5661	78.2233	92.7786		79.9432	79.9432	93.6076	100.093	78.1639	95.095				80.2774
15	100.112	77.7327	91.8394		79.5915	79.5915	92.9281	100.055	77.6391	94.4572				79.4232
16	99.7756	76.8067	90.6385		79.0255	79.0255	92.0696	99.9769	77.0310	93.5556				78.3949
17	99.7415	75.2590	89.9046		78.1352	78.1352	91.6589	99.8491	75.8478	93.0408				77.2214
18	99.7994	74.6867	89.2766		77.4672	77.4672	99.1601	99.9293	75.1827	92.5136				77.2214
19	99.9178	73.8753	89.4457		76.8230	76.8230	91.2817	100.094	74.3926	92.8820				76.4035
20	99.8945	72.8982	88.7122		76.0882	104.421	90.0750	99.9970	73.6472	91.2341				76.4035
21	102.547	72.1896	88.4438		108.290	75.3168	89.5613	108.541	72.7477	90.5014				75.7963
22	105.583	72.3296	88.0352		115.428	75.5291	88.7668	108.302	72.3316	84.8731				76.1629
23	105.993	72.3847	87.5731		115.596	75.5422	88.1169	108.672	72.1629	83.8471				76.2716
24	111.873	71.4175	87.0219		119.712	74.7683	119.712	112.192	71.3194	81.3742				75.4070
25 1932	113.769	70.3520	85.9643		73.9321	73.9321	119.070	112.270	70.5904	88.3094				74.3195
26	113.339	70.1503	84.8910		75.708	74.1097	118.624	111.781	70.7494	87.4901				74.4346
27	111.082	69.4382	84.0349		80.8033	73.5643	85.9322	109.921	70.1535	80.0904				73.8478
28	105.911	68.3556	83.0837		118.686	72.5842	85.3491	109.083	69.1626	86.2698				72.5734
29	110.933	67.0549	82.5326		117.974	71.6234	85.1811	110.079	69.2427	80.4405				71.5734
30	111.310	65.8001	82.4490		118.626	70.3421	84.9678	109.909	66.8607	79.6162				70.3705
31	111.912	65.0645	77.7104		119.848	70.5043	84.2584	109.472	66.2695	78.7172				70.5481
32	112.642	67.0655	77.7325		121.079	70.6272	83.9075	111.188	67.3078	77.4565				71.1931
33	112.400	67.6613	82.5030		121.62	70.9594	84.0049	110.829	67.5235	78.5735				71.3772
34	111.177	66.7028	82.8667		122.291	70.3316	83.9858	111.646	66.8442	78.2539				70.5076
35	115.319	66.4541	78.4143		124.351	70.2389	83.7387	113.441	66.7890	84.4288				70.4655
36	114.754	66.6224	82.0207		124.289	69.5444	83.5502	113.450	66.4267	84.9267				69.7450
37 1933	113.821	65.0172	74.7135		123.903	68.9507	83.0365	112.538	83.5048	74.1001				69.1527
38	113.953	64.0649	75.5029		124.348	68.3094	82.8269	113.110	85.5270	74.7971				69.5951
39	114.069	63.8594	75.937		123.922	67.626	82.0514	112.917	82.8896	75.6422				68.0564
40	115.896	64.2244	77.4440		124.908	67.6377	81.6984	111.038	82.357	76.8397				68.1715
41	121.152	65.2185	78.6908		125.110	68.5299	81.9443	109.597	81.8505	79.0032				69.7581
42	122.567	66.9070	79.2579		125.413	69.8231	82.2440	109.158	82.3426	80.2470				69.7581
43	126.351	68.4250	81.4989		132.147	70.6916	82.7662	125.849	81.4576	82.4270				71.0772
44	128.146	68.2965	84.4796		132.330	70.5008	83.1212	125.708	84.0325	82.3051				71.0877
45	131.498	68.5310	85.740		136.838	70.7999	83.3172	130.727	84.5223	82.2933				71.0499
46	133.861	68.2521	85.6530		136.376	70.7369	83.7726	130.618	84.4407	83.6420				70.9473
47	136.466	68.1573	84.4742		136.984	70.8952	83.8824	132.894	85.2626	82.6952				69.9521
48	134.553	68.2970	82.0749		135.866	71.5089	83.6624	130.708	84.9767	80.5242				71.4579

	F17	F18	F19	F20	B13	B14	B15	B16	B17	B18	B19	B20	H13	H14
49	136.686	69.4147	81.7923	81.6402	138.012	72.3320	134.522	83.4307	132.673	70.0266	84.0931	80.5810	77.703	72.2276
50	141.221	70.0076	81.7279	83.6053	143.378	72.5153	139.772	83.3508	138.511	70.1793	84.2206	82.1902	72.589	72.4123
51	142.560	69.6901	81.1563	85.6937	144.407	72.1491	140.826	83.0939	137.526	69.4793	84.4603	84.4603	44.117	72.758
52	142.457	69.1537	80.4044	86.0304	144.500	71.306	140.972	82.8079	137.547	69.3895	84.2324	84.0174	14.549	71.5666
53	142.023	69.212	80.1858	87.0727	145.391	71.7132	141.931	82.6289	137.791	69.2618	84.2274	84.7441	45.5502	71.7493
54	143.136	69.6167	80.8079	87.1908	145.842	71.9252	142.341	82.9281	137.904	69.4274	84.2219	84.7441	46.533	71.1207
55	142.797	69.8451	82.2398	86.2050	146.508	72.1963	142.248	83.3572	137.904	69.5355	85.0712	84.6687	46.343	72.6433
56	143.363	69.7643	82.0338	86.4111	146.845	72.9377	142.665	83.6930	139.110	70.1787	84.9023	83.5976	44.313	73.2751
57	144.190	70.6221	82.6934	85.6206	147.526	72.9377	143.385	83.8466	139.38	70.9029	85.1013	83.5470	47.134	73.9967
58	144.306	70.0463	82.8114	86.0563	147.094	72.3158	142.898	83.8369	138.908	70.9232	84.4233	83.3050	47.441	72.7725
59	142.945	69.9059	82.7517	86.4447	146.138	72.2024	141.965	83.7418	137.657	69.0009	85.1329	85.1050	48.199	72.6571
60	143.750	70.7154	82.2191	83.8544	147.323	72.1136	142.995	87.5237	137.647	68.8148	84.5586	84.2210	73.247	73.317
61	144.359	71.1189	82.0267	82.7980	147.483	72.6845	143.059	83.3034	139.151	69.7598	81.4434	47.28	73.247	73.477
62	144.734	71.1265	81.7285	83.7935	147.688	72.4224	143.297	83.1724	139.432	69.6342	84.2089	81.493	72.965	72.945
63	144.372	70.7202	80.9041	85.0103	147.270	71.8624	142.915	82.8506	138.731	69.9746	83.7767	82.6123	49.759	73.5702
64	152.340	72.7780	81.2875	86.3229	107.672	71.1975	104.353	83.0341	101.564	69.5195	83.8601	82.9781	73.5536	73.5336
65	151.625	73.5931	81.5159	87.7776	107.120	72.6141	104.353	83.1541	101.116	69.0737	83.8621	84.1533	74.179	74.190
66	151.521	73.1397	82.3549	88.0196	106.603	72.3638	103.644	83.3727	100.718	68.9058	84.1954	85.750	74.3187	74.3187
67	151.631	73.2753	82.5596	88.4152	106.209	72.2161	103.072	83.4361	100.718	68.9617	83.7118	84.5211	50.536	75.3659
68	151.583	72.6189	82.7673	89.3210	105.994	72.7078	102.717	83.4361	100.157	69.5321	84.4730	50.542	74.5135	74.3655
69	151.618	74.4657	83.6950	90.0044	106.316	72.5008	102.508	83.3200	100.483	70.2892	83.9800	50.540	74.3655	73.5702
70	151.821	74.4668	84.5101	90.5101	106.454	74.3002	102.805	93.7234	100.211	69.1747	84.6699	50.203	74.9735	75.9735
71	151.523	75.3509	84.8619	90.7431	107.016	74.6275	103.581	84.2077	100.483	68.9737	84.4514	51.414	76.3168	74.741
72	151.817	75.4641	84.8781	91.1910	106.730	74.9309	103.282	84.2592	100.448	85.0852	84.6650	51.414	76.5645	74.741
73	151.558	75.4261	84.8560	86.6797	106.853	74.9912	103.433	84.7339	100.451	85.0872	82.8431	151.633	76.6172	76.5645
74	152.271	75.2931	84.5669	87.2597	106.618	75.1747	103.228	84.5019	100.570	72.0878	83.4401	151.537	76.7257	76.5645
75	151.502	74.8574	83.7634	86.8962	106.766	75.177	103.361	84.3121	100.592	71.9101	83.5189	151.593	76.5956	76.5956
76	151.092	74.7313	83.6941	90.3891	106.085	75.0951	103.485	84.5711	100.630	84.9637	85.548	51.241	76.6203	76.417
77	150.780	74.2453	83.964	91.5667	106.743	74.9169	103.371	84.5641	100.621	84.4724	85.222	50.222	75.135	75.135
78	150.512	74.4630	83.3478	92.2717	106.805	75.1279	102.680	85.1136	100.304	73.2116	86.0813	49.047	75.6135	75.5135
79	151.143	75.7483	84.2317	92.7064	105.969	75.3441	102.564	85.3532	100.500	73.3130	86.0610	58.782	76.5135	75.5135
80	150.296	76.7676	84.931	93.6349	105.395	77.932	102.319	85.6718	99.246	73.1116	86.0286	50.761	77.361	70.5097
81	146.074	77.5693	84.4663	94.5053	106.229	77.5346	102.537	86.0830	98.707	75.6017	86.0286	147.441	70.5097	74.744
82	111.719	78.8713	86.4134	95.1372	114.753	80.0529	111.527	86.9355	99.403	78.7417	89.2205	124.111	74.929	73.929
83	111.075	80.1355	86.7342	94.8703	115.312	91.2835	112.080	87.2798	99.508	89.4285	89.9422	50.4064	51.444	73.628
84	111.571	82.5134	86.8351	93.8635	114.652	93.3343	111.427	87.8038	99.264	89.3196	90.0211	25.464	51.447	70.4647
85	110.954	94.2364	87.3552	93.3396	114.273	85.2619	88.3779	88.3779	90.1384	89.0827	82.8484	127.777	85.2925	85.2925
86	110.843	85.5359	87.7570	94.251	114.455	90.003	88.9627	88.9627	90.145	89.9026	89.7032	127.570	90.9006	90.9006
87	109.403	89.1527	87.9049	95.6902	114.645	95.1360	89.4319	89.4319	111.351	91.2173	90.2001	29.575	93.2122	93.2122
88	106.791	86.1288	87.4903	94.4903	114.205	88.7090	90.1182	90.1182	111.457	90.9030	29.903	29.533	94.2584	94.2584
89	106.170	48.1051	88.2936	98.7242	114.521	98.6811	90.4917	90.4917	111.605	88.2588	73.541	28.725	99.3551	99.3551
90	105.323	87.6990	89.2023	99.5815	114.032	98.8424	90.9368	90.9368	110.477	90.2088	73.8209	129.725	85.3261	85.822
91	90.1437	95.6895	88.6939	95.7432	116.768	90.054	91.7968	91.7968	90.331	93.4734	77.0397	128.937	85.822	85.822
92	94.7833	87.9774	88.8475	100.287	116.791	90.2293	92.2277	92.2277	90.134	89.5116	73.8209	130.584	89.7714	89.7714
93	35.4175	87.3594	90.8397	118.244	113.996	92.0438	93.0438	93.0438	90.135	93.4096	86.1311	130.319	94.950	94.950
94	79.4649	86.2509	51.3702	95.7064	116.598	93.6026	93.6026	93.6026	89.146	89.9925	95.4525	20.447	89.7196	89.7196

	F17	F18	F19	F20	B13	B14	B15	B16	B17	B18	B19	B20	H13	H14
95	79.5858	84.0340	91.357	96.8189	120.003	88.9291	117.016	94.1103	119.815	86.1570	93.3809	93.6126	132.358	87.8489
96	80.0072	83.3341	91.0166	93.1481	120.477	88.7437	116.889	94.2987	119.612	86.4852	90.8544	97.6556	132.366	87.6220
97	78.5130	83.2578	90.4075	90.4511	120.204	88.7703	116.831	94.0367	119.727	87.9915	88.2748	88.3418	97.6556	
98	77.2139	82.3851	89.8915	90.6414	120.920	88.0240	117.670	94.1461	120.441	88.9578	88.3426	88.4306	97.6557	
99	73.6113	81.4239	89.2361	91.1571	122.104	87.5695	118.954	93.8377	121.846	86.4474	88.5518	86.4599	
100	73.2106	80.6954	89.2204	91.4262	122.153	87.3011	119.032	94.0686	121.917	86.4063	89.0142	86.0982	
101 (1938)	66.7525	79.6139	89.1295	91.4344	124.605	87.0206	121.648	93.9549	125.381	86.1695	89.3124	95.1395	
102	65.6409	79.4496	90.2641	91.3607	126.576	87.1074	123.784	94.6087	126.940	89.1675	95.1577	
103	65.6748	79.2161	91.6112	126.944	87.0707	124.070	94.3135	127.068	88.8327	95.6572	
104	64.4931	78.0946	89.1263	92.2292	127.820	86.4662	125.001	94.1228	127.579	88.4421	95.875	
105	64.4877	77.8765	89.1846	93.4921	129.110	86.3548	126.311	94.1609	128.967	90.0643	95.1972	
106	64.0232	77.6106	89.4613	93.2293	130.107	86.7706	127.348	94.5825	129.715	90.0092	95.1972	
107	63.6040	77.0444	89.4887	93.6406	131.438	86.7326	128.716	94.8684	130.630	84.4112	90.9845	14.359	671
108 (1939)	63.7564	77.0151	89.2671	52.947	131.405	87.1039	128.684	94.8892	130.478	84.8536	97.3301	14.359	
109	63.8009	76.7056	89.2557	131.694	97.1378	128.971	95.0561	130.783	84.7822	92.7348		
110	64.9506	76.5106	88.4745	131.296	97.1279	128.589	94.9383	130.362	84.5519			
111	64.1604	76.5042	88.2335	131.023	87.2327	128.320	94.9824	130.139	84.6400			
112	64.1936	76.6307	88.0578	131.328	87.1205	128.475	95.1560	130.302	84.2427			
113	64.6204	76.8802	87.6143	132.669	95.5004	129.781	95.1852	131.598	84.8111			
114	64.0764	76.5183	88.2951	133.422	87.5367	130.579	95.6040	131.578	84.5009			
115	64.0409	76.1204	88.2933	134.602	87.4091	131.772	95.9364	131.457	84.0409			
116	63.5096	76.2372	88.0301	136.593	97.5550	135.958	96.1044	132.385	84.6045			

	H15	H16	H17	H18	H19	H20	W13	W14	W15	W16	W17	W18	W19	W20
(1930)	90.0074	97.7174	100.45	90.3610	101.133	100.765	95.4733	100.644	97.9925	100.74	141.248	95.3179	
	90.3353	97.6324	99.8058	94.7965	101.508	100.864	93.8080	99.5903	100.108	94.5490	139.911	85.2943	
	90.3743	95.8134	99.7349	93.0396	100.205	101.268	92.0964	101.157	82.6533	137.205	85.4335	
	90.2004	96.6762	92.8957	82.5519	93.9430	101.244	91.4675	101.153	92.1933	137.255	85.4535	
	89.5172	95.2104	92.5872	91.1947	99.3014	101.317	90.3361	131.598	104.401	92.1933	138.109	95.7602	
	88.3629	95.3629	92.0599	91.1030	98.0335	102.024	88.0511	104.053	91.7420	137.756	85.8744	
	90.0354	95.7190	94.6723	87.0492	98.3002	102.440	88.3066	101.505	90.7209	139.519	85.6957	
	94.0339	95.7746	99.5595	86.6539	98.7171	102.637	87.6066	100.559	86.5901	144.424	85.8524	
	94.3170	96.7559	100.083	85.2932	93.9632	102.531	86.3133	100.464	90.1345	
	94.5519	95.6594	100.147	85.3376	98.5578	102.012	84.7056	100.578	98.3866	
(1931)	94.5819	100.015	92.1547	98.3745	102.675	83.4532	100.405	98.7500	
	90.4654	97.6854	99.7669	95.8708	104.097	80.6376	97.5752	90.9579	
	98.3359	93.7662	78.1482	94.5372	104.256	80.2355	78.2609	100.721	
	95.3054	77.7896	93.6554	103.481	79.9886	94.795	
	90.5729	99.5905	77.7306	104.707	92.4675	77.2144	95.8770	
	95.5250	104.707	78.5265	75.5099	95.2927	
	104.063	92.1202	105.250	77.9454	75.5295	92.7870	
	106.152	74.7735	105.623	77.3970	75.3372	93.5370	
	106.263	93.5242	105.623	76.5755	91.3190	85.3669	
	93.1112	91.5435	105.954	76.5755	73.5190	85.7669	
	105.424	72.8024	112.148	75.2874	90.8203	85.6957	
	105.324	72.9024	115.667	75.8577	108.308	89.0862	

H15	H16	H17	H18	H19	H20	W13	W14	W15	W16	W17	W18	W19	W20
143.689						145.859	75.5759						
143.593						146.776	75.8614						
143.919						146.394	75.9507						
143.854						147.001	76.1185						
143.895						147.644	76.1990						
148.564						147.270	76.0369						
142.621						145.943	75.8615						
142.072						145.512	77.0398						
142.882						146.680	77.1122						
142.483						146.430	77.9989						
139.726						143.918	78.4882						
117.760						113.126	80.2392						
116.782						113.250	84.3133						
119.527							85.2755						
120.769						112.508	85.1564						
120.802						112.148	85.9344						
121.078						112.216	87.8820						
121.039						112.274	88.4320						
121.167						112.315	88.6322						
121.641						112.452	85.7449						
123.228						114.554	88.7872						
123.299						114.687	89.9367						
124.430						115.928	90.2805						
125.476						117.304	89.8443						
125.068						117.305	88.7453						
125.462						117.261	88.6102						
125.993						117.698	88.6455						
126.845						118.629	88.0913						
127.619						119.296	87.6384						
127.804						119.299	87.4017						
129.443						120.804	87.1439						
130.473						122.148	57.9950						
130.362						122.686	87.2609						
130.442						123.770	84.2805						
130.081						123.282	86.7352						
131.523						123.232	87.6696						
133.071						125.332	87.0205						
133.699						125.501	87.3402						
132.193						125.555	87.4254						
131.556						125.335	87.4274						
130.264						124.682	87.5801						
130.398						124.765	87.5178						
131.464						124.609	87.8412						
131.182						125.908	88.0105						
132.922						127.336	87.9573						
137.854						131.467	87.9807						

1936
1937
1938
1939

		K21	K22	S21	S22	C21	C22	F21	F22	B21	B22	H21	H22	W21	W22
1930	I	95.902	100.203	106.302	97.207	102.769	101.771	96.172	100.719	98.927	105.428	94.533	95.603	100.133	99.201
	II	94.628	96.371	107.397	92.191	102.514	103.196	96.843	103.864	99.722	104.970	92.442	97.629	100.156	99.464
	III	94.158	95.718	105.925	96.525	102.376	102.812	97.607	108.250	98.515	105.086	94.043	98.189	102.254	100.291
	IV	93.028	96.870	108.352	95.744	100.783	100.737	95.680	110.204	98.903	106.047	95.389	96.283	103.331	98.560
1931	I	93.110	97.851	107.004	94.717	101.308	100.539	100.033	113.206	99.110	103.308	96.182	96.753	103.613	100.147
	II	94.247	97.113	104.122	94.460	101.358	99.814	102.769	116.449	99.430	100.360	96.526	98.960	103.398	100.147
	III	91.874	95.612	104.472	94.734	100.766	99.154	106.813	118.328	100.157	100.648	96.132	100.699	106.234	103.018
	IV	77.526	77.754	119.675	109.883	87.553	99.56	112.474	123.139	105.424	111.374	101.666	111.876	115.195	131.496
1932	I	79.055	77.663	116.116	108.542	100.484	97.502	112.554	125.721	103.530	108.873	101.829	112.007	113.230	113.322
	II	81.531	81.323	112.637	104.762	101.509	96.430	113.885	127.900	100.137	104.548	101.678	110.543	110.544	112.138
	III	76.242	77.929	117.913	106.155	104.045	98.949	114.353	128.579	100.235	106.205	103.918	113.967	111.680	112.492
	IV	74.181	74.810	120.467	107.145	103.846	100.237	112.527	128.660	104.542	113.323	107.035	116.468	112.559	112.060
1933	I	78.091	77.668	116.482	104.845	99.277	94.948	114.646	131.315	105.119	114.780	106.480	115.335	111.422	111.496
	II	84.178	82.192	106.238	95.130	98.054	91.465	114.441	141.392	107.710	117.515	107.522	121.254	117.463	116.235
	III	90.044	89.544	96.628	83.975	95.404	88.650	122.309	150.258	111.386	123.844	113.492	130.716	121.594	124.784
	IV	91.210	92.978	95.309	80.333	93.339	86.907	125.706	154.402	110.359	128.838	119.684	134.383	124.541	126.631
1934	I	91.345	91.907	93.315	78.583	92.981	86.523	130.412	161.959	110.352	131.237	125.387	140.743	127.165	130.424
	II	90.828	90.226	93.932	79.439	94.726	87.089	127.168	166.820	110.328	127.055	128.126	144.801	127.604	132.555
	III	89.748	91.136	95.638	79.402	95.778	87.828	122.264	165.137	110.574	127.781	126.701	143.452	127.785	132.761
	IV	87.791	90.083	99.608	81.245	95.057	87.676	117.270	158.283	109.855	131.594	127.823	141.821	128.446	131.437
1935	I	87.270	88.150	103.402	84.425	92.578	86.522	112.943	153.445	110.363	128.129	128.481	142.718	127.286	132.327
	II	89.64	89.594	106.580	85.554	93.504	87.783	112.746	165.216	87.758	91.515	129.851	148.302	127.371	135.256
	III	91.330	93.514	101.733	86.844	91.553	87.277	107.277	157.240	94.200	95.297	128.076	144.963	131.788	136.693
	IV	91.345	94.129	104.522	86.350	90.661	86.870	109.744	153.737	95.280	100.268	129.245	143.782	132.362	135.910

	K21	K22	S21	S22	C21	C22	F21	F22	B21	B22	H21	H22	W21	W22
1936 I	92.547	94.261	102.514	85.884	90.514	86.758	116.106	155.592	95.474	100.730	127.409	142.407	128.952	136.152
II	93.200	93.287	101.233	86.574	90.544	86.826	119.981	160.010	94.496	98.763	124.862	139.180	128.557	135.673
III	93.435	94.623	100.159	87.147	91.798	86.441	123.212	159.932	92.445	96.560	124.01	135.752	126.596	132.871
IV	97.252	99.449	102.083	91.574	95.046	89.324	103.134	122.753	100.839	109.862	105.394	112.098	100.885	101.491
1937 I	97.151	97.748	99.427	90.980	94.315	88.393	110.944	129.011	101.114	110.120	109.172	112.907	99.138	100.228
II	100.613	97.441	96.773	91.396	95.360	88.029	105.679	129.441	102.824	108.301	110.389	113.171	98.935	100.588
III	103.025	101.715	98.207	92.332	96.613	88.379	91.806	109.160	106.762	113.494	113.618	116.654	101.585	103.785
IV	101.808	104.696	97.866	91.646	97.205	88.151	92.916	102.107	106.357	118.352	116.444	116.572	103.169	104.577
1938 I	101.995	104.357	94.924	90.164	100.259	88.877	92.910	100.323	106.603	119.375	118.476	117.572	106.366	105.406
II	101.441	105.111	96.867	92.000	101.890	90.540	87.382	95.502	108.633	120.106	119.282	120.126	109.192	107.835
III	99.536	105.809	100.817	92.791	100.099	91.948	85.978	90.067	110.082	123.160	119.072	120.362	110.894	109.542
IV	96.463	102.033	104.306	93.774	96.624	92.279	87.057	91.277	111.848	124.913	121.140	120.712	112.858	110.720
1939 I	95.454	100.156	103.512	93.624	96.616	92.318	91.266	94.469	109.134	126.622	119.647	119.450	112.435	109.481
II	96.390	99.703	102.623	93.399	97.279	93.112	90.753	96.211	109.473	123.545	118.301	118.780	112.578	109.266
III	96.896	100.809	101.731	95.013	97.398	93.176	90.277	95.578	109.582	123.405	120.046	118.041	114.574	110.167

	K23	S23	C23	F23	B23	H23	W23
Canada	22.31320	31.24300	—	11.27310	10.74900	10.51290	11.10750
U.S.	37.01710	—	45.23330	26.38900	22.65300	22.79050	23.60680
Belgium	10.92360	9.17707	6.23337	18.82920	—	12.12800	9.08280
France	15.45250	13.86630	8.21421	—	22.78420	13.28580	24.14800
Holland	10.29180	7.83706	4.97194	8.00886	14.66140	—	7.79078
Switzerland	3.92185	3.08507	2.19300	7.47160	3.63540	3.68508	—
U.K.	—	34.79140	33.15420	28.06740	25.53700	31.53760	24.2640

ADDITIONAL BIBLIOGRAPHY

(Main Bibliography to follow)

Baillie, R.T. and McMahon, P.C. "Interest Rates and Investment in West Germany", Empirical Economics, Vol. 5, 1981, pp. 1-9.

Brillembourg, A. and Khan, M.S. "The Relationship between Money, Income and Prices. Has Money Mattered Historically?" Journal of Money, Credit and Banking, vol. 11, 1979, pp. 358-365.

Brooks, S.J. "The Experience of Floating Exchange Rates" in R. Major, ed., "Britain's Trade and Exchange-Rate Policy" (Heinemann 1979).

Brunner, K. and Meltzer, A.H. "Three Aspects of Policy and Policy Making", Supplement to Journal of Monetary Economics, Carnegie-Rochester Conference, Series on Public Policy, vol. 10, 1979, N. Holland Publishing Co., Amsterdam.

Eichengreen, B.J. "The Causes of British Business Cycles, 1830-1914", mimeo,Harvard University, April, 1980.

Granger, C.W.J. "Investigating Causal Relations by Econometric Models and Cross Spectral Methods", Econometrica, vol. 37, 1969, pp. 424-38.

Hatton, T.J., Lyons, J.S. and Satchell, S.E. "Eighteenth-Century British Trade: Home-Spun or Empire-Made?" Paper presented to S.S.R.C. Quantitative Economic History Study Group, September, 1981, University of Essex.

Jacobs, R.L. Leamer, E.E. and Ward, M.P. "Difficulties with Testing for Causation", Economic Inquiry, vol. 17, 1979, pp. 401-413.

Nelson, C.R. "Discussion of the Zeller and Schwert Papers" in Brunner and Meltzer, eds., (1979), pp. 97-102.

Pierce, D.A. "Relationships - and the Lack of Thereof - Between Economic Time Series, with Special Reference to Money and Interest Rates", Journal of the American Statistical Association, vol. 72, pp. 11-22.

Pierce, D.A. and Haugh, L.D. "Causality in Temporal Systems", Journal of Econometrics, vol. 5, 1977, pp. 265-293.

Schwert, G.W. "Tests of Causality: The Message in the Innovations" in Brunner and Meltzer, eds., (1979), pp. 55-96.

Sims, C.A. "Money, Income and Causality", AER, 1972, vol. 62, pp. 540-552.

Sims, C.A. "A Comment on the Papers by Zellner and Schwert" in Brunner and Meltzer, eds., (1979), pp. 103-108.

Williams, D., Goodhart, C.A.E. and Gowland, D.H. "Money, Income and Causality: The U.K. Experience", AER, vol. 66, 1976, pp. 417-23.

Zeller, A. "Causality and Econometrics" in Brunner and Meltzer, eds., 1979, pp. 9-54.

BIBLIOGRAPHY

Aldcroft, D.H. (1977) The Inter-War Economy: Britain, 1919-39
(Batsford, London).

_____, (1978) The European Economy, 1914-70 (Croom Helm,
London).

Aliber, R.Z. (1962) Speculation in the Foreign Exchanges: The
European Experience, 1919-26 (Yale Economic
Essays, Vol. 2).

_____, (1970) Speculation in the Flexible Exchange Revisited
(Kyklos, Vol. 23).

_____, (1973a) Speculation in the Flexible Exchange - Reply
(Kyklos, Vol. 26).

_____, (1973b) The Interest Rate Parity Theorum: A Reinterpretation
(J. of Political Economy, Vol. 81).

_____, (1976) The Firm under Pegged and Floating Exchange Rates
(Scandinavian Journal of Economics, Vol. 78).

Allen, R.G.D. (1975) Index Numbers in Theory and Practice (Macmillan).

Almon, S. (1965) The Distributed Lag between Capital Appropriations
and Expenditure (Econometrica, Vol. 22).

Andrews, B.P.A. (1982) Measuring Currency Movements, (mimeo, Balliol College
Oxford).

Armington, P.S. (1969a) A Theory of Demand for Products Distinguished
by Place of Production (IMF Staff Papers,
Vol. 16).

_____, (1969b) The Geographic Pattern of Trade and the Effects
of Price Changes (IMF Staff Papers, Vol. 16).

Arndt, H.W. (1944) The Economic Lessons of the Nineteen-Thirties
(Oxford University Press).

Arndt, S.W. (1968) International Short Term Capital Movements: a
Distributed Lag Model of Speculation in Foreign
Exchange (Econometrica, Vol. 25).

Artus, J.R. (1978) Methods of Assessing the Long Run Equilibrium
Value of an Exchange Rate (J. of International
Economics, Vol. 8).

Artus, J.R. and McGuirk, A.K. (1981) A Revised Version of the Multilateral
Exchange Rate Model (IMF Staff Papers,
Vol. 28).

Artus, J.R. and Rhomberg, R.R. (1975) A Multilateral Exchange Rate Model
(IMF Staff Papers, Vol. 22).

Balassa, B. (1964)   The Purchasing Power Parity Doctrine - A
                     Reappraisal (J. of Political Economy, Vol. 72).

_____, (1973)   Just How Misleading are Official Exchange Rate
                     Conversions? A comment (Economic Journal, Vol. 83).

_____, (1974)   Purchasing Power Parity and Factor Price
                     Equilisation: Comment (Kyklos, Vol. 27).

Ball, R.J., Burns, T. and Laury, J.S.E (1977) The Role of Exchange
                     Rate Changes in Balance of Payments,
                     Adjustment: the U.K. Case (Economic
                     Journal, Vol. 87).

Batchelor, R.A. (1977)   Sterling Exchange Rates, 1951-76: A
                     Cassellian Analysis (National Institute
                     Economic Review, No. 81).

Bank of England (1968)   The Exchange Equilisation Account: Its Origins
                     and Developments (Quarterly Bulletin, Vol. 8).

Baumol, W.J. (1957)   Speculation, Profitability and Stability (Review
                     of Economics and Statistics, Vol. 39).

_____, (1959)   Reply (Review of Economics and Statistics, Vol. 41).

Belanger, G. (1976)   An Indicator of Effective Exchange Rates for
                     Primary Producing Countries (IMF Staff Papers,
                     Vol. 23).

Black, S.W. (1974)   Multilateral and Bilateral Measures of Effective
                     Exchange Rates in a World Model of Traded Goods
                     (J. of Political Economy, Vol. 84).

Blackhurst, R. and Tumlir, J. (1980)   Trade Relations under Flexible
                     Exchange Rates (GATT Studies in
                     International Trade, No. 8).

Branson, W.H. (1976)   Asset Markets and Relative Prices in Exchange
                     Rate Determination (Seminar Paper No. 66, Institute
                     for International Economic Studies, University of
                     Stockholm).

Brebner, J.B. (1945)   North Atlantic Triangle: The Interplay of Canada,
                     the United States and Great Britain (Yale University
                     Press, New Haven).

Brecher, I. (1957)   Monetary and Fiscal Thought and Policy in Canada,
                     1919-38 (University of Toronto Press).

Brillembourg, A. (1977)   Purchasing Power Parity and the Balance of
                     Payments: Some Empirical Evidence (IMF Staff
                     Papers, Vol. 24).

Brittan, S. (1970)   The Price of Economic Freedom: A Guide to Flexible
                     Exchange Rates (Macmillan, London).

Brown, Jnr., W.A. (1940)   The International Gold Standard Reinterpreted, 1914-34 (National Bureau of Economic Research, Inc., New York; 2 vols.).

Bunting, F.H. (1939)   The Purchasing Power Parity Theory Re-examined (Southern Economic Journal, Vol. 5).

Capie, F. (1974)   Ottawa: An Aspect of Imperial Commercial Policy (Warwick Economic Research Paper, No. 41).

_____, (1978)   The British Tariff and Industrial Production in the 1930's (Economic History Review, Vol. 31).

Cassel, G. (1918)   Abnormal Deviations in International Exchanges (Economic Journal, Vol. 28).

_____, (1922)   Money and Foreign Exchange after 1914 (London).

Chang, T.C. (1951)   Cyclical Movements in the Balance of Payments (University Press, Cambridge).

Clague, C. and Tanzi, V. (1972)   Human Capital, National Resources and the Purchasing Power Parity Doctrine: Some Empirical Results (Economia Internazionale, Vol. 25).

Clarke, S.V.O. (1973)   The Reconstruction of the International Monetary System: The Attempts of 1922 and 1933 (Princeton Study in International Finance, No. 33).

_____, (1977)   Exchange Rate Stabilisation in the mid-1930's: Negotiating the Tripartite Agreement (Princeton Study in International Finance, No. 41).

Clement, K.W. and Frenkel, J.A. (1980)   Exchange Rates, Money and Relative Prices: the Dollar-Pound in the 1920's (J. of International Economics, Vol. 10).

Comstock, A.P. (1933)   The British Exchange Equalisation Account (American Economic Review, Vol. 23).

Crowe, W.R. (1965)   Index Numbers (Macdonald and Evans).

Day, W.H.L. (1977)   Flexible Exchange Rates: A Case for Official Intervention (IMF Staff Papers, Vol. 24).

Dimsdale, N.H. (1981)   British Monetary Policy and the Exchange Rate (Oxford Economic Papers, Vol. 33, Supplement).

Dixon, P.B. (1976)   Effective Exchange Rates and the IMF's Multilateral Exchange Rate Model: A Review (Australian Economic Papers, Vol. 15).

Dornbusch, R. and Jaffee, D. (1978)   Purchasing Power Parity and Exchange Rate Problems: Introduction (J. of International Economics, Vol. 8).

Drummond, I.M. (1979)   London, Washington and the Management of the Franc, 1936-39 (Princeton Study in International Finance, No. 45).

Economic Progress Report (1977) The Effective Exchange Rate for
                                 Sterling (March, pp. 1-3).

Economic Trends (1974) The Effective Exchange Rate for Sterling
                        (June, pp. xxix - xxxv).

Eichengreen, B.J. (1980) Did Speculation destabilise the French franc
                          in the 1920's? (mimeo, Yale University).

Einzig, P. (1935) World Finance since 1914 (Macmillan, London).

_____, (1937) The Theory of Forward Exchange (Macmillan, London).

_____, (1961) A Dynamic Theory of Forward Exchange (Macmillan,
                    London).

_____, (1970) The Case Against Floating Exchanges (Macmillan,
                    London).

Feltenstein, A., Goldstein, M. and Schadler, S.M. (1979) A Multilateral
                                 Exchange Rate Model for Primary Producing
                                 Countries (IMF Staff Papers, Vol. 26).

Ford, A.G. (1958) Flexible Exchange Rates and Argentina, 1885-1900
                   (Oxford Economic Papers, Vol. 10).

Frenkel, J.A. (1976) A Monetary Approach to the Exchange Rate:
                      Doctrinal Aspects and Empirical Evidence
                      (Scandinavian Journal of Economics, Vol. 78).

_____, (1978) Purchasing Power Parity: Doctrinal Perspectives
                    and Evidence from the 1920's (J. of International
                    Economics, Vol. 8).

_____, (1980a) Exchange Rates, Prices and Money: Lessons from
                     the 1920's (American Economic Review, Vol. 70).

_____, (1980b) The Collapse of Purchasing Power Parities during
                     the 1970's (Report 8024, Centre for Mathematical
                     Studies in Business and Economics).

Frenkel, J.A. and Johnson, H.G. (1976) (eds.) The Monetary Approach
                                 to the Balance of Payments (Allen and
                                 Unwin, London).

_____, (1978) (eds.) The Economics of Exchange
                          Rates: Selected Studies (Addison-Wesley
                          Pub. Co., Reading, Massachusetts).

Frenkel, J.A. and Levitch, R.M. (1975) Covered Interest Arbitrage:
                                 Unexplained Profits? (J. of Political
                                 Economy, Vol. 83).

Friedman, M. (1953) The Case for Flexible Exchange Rates (in "Essays
                     in Positive Economics", Chicago).

Friedman, M. and Roosa, R. (1967)   The Balance of Payments: Free
                                    versus Flexible Exchange Rates
                                    (American Enterprise Institute for
                                    Public Policy, Washington).

Friedman, M. and Schwartz, A.J. (1963) A Monetary History of the United
                                    States, 1867-1960 (National Bureau of
                                    Economic Research, Princeton).

Frost, P.A. (1975) Some Properties of the Almon Lag Technique when one
                    searches for degree of polynomial and lag (J. of
                    American Statistical Society, Vol. 70).

Gaillot, H.J. (1970) Purchasing Power Parity as an Explanation of
                      Long Term Changes in Exchange Rates (J. of Money,
                      Credit and Banking, Vol. 2).

Genberg, H. (1978) Purchasing Power Parity under Fixed and Flexible
                    Exchange Rates (J. of International Economics,
                    Vol. 8).

Glickman, D.R. (1947) The British Imperial Preference System (Quarterly
                       Journal of Economics, Vol. 61).

Griliches, Z. (1967) Distributed Lags: A Survey (Econometrica, Vol. 35).

Grissa, A.R. (1967) The Stability of Flexible Exchange Rates: the
                     Case of the French and British Experience in the
                     1920's (unpublished Ph.d. dissertation, Brown
                     University).

Haberler, G. (1961) A Survey of International Trade Theory (2nd ed.,
                     Princeton Special Studies in International Economics,
                     No. 1).

Hall, N.F. (1938) The Foreign Exchanges (in British Association: "Britain
                   in Recovery", Sir Isaac Pitman and Sons, London).

Halm, G. (1970) (ed.) Approaches to Greater Flexibility of Exchange
                       Rates: The Bürgenstock Papers (Princeton University
                       Press).

Hawke, G.R. (1975) Income Estimates from Monetary Data: Further
                    Explanations (Review of Income and Wealth, Vol. 21).

Hirsch, F. and Higgins, I. (1970) An Indicator of Effective Exchange
                                   Rates (IMF Staff Papers, Vol. 17).

Hirsch, F. and Higham, D. (1974) Floating Exchange Rates - Expectations
                                  and Experience (Three Banks Review, No. 102)

Hodgson, J.H. (1971) Fluctuations of the Pound Sterling, 1919-25
                      Unpublished Ph.d. dissertation, University of
                      Virginia).

_____, (1972) An Analysis of Floating Exchange Rates: the Pound-
                     Dollar Rate, 1919-25 (Southern Economic Journal,
                     Vol. 39).

Hodgson, J.H. and Phelps, P. (1975) The Distributed Lag Impact of Price Level Variation on Floating Exchange Rates (Review of Economics and Statistics, Vol. 57).

Hodson, H.V. (1938) Slump and Recovery, 1929-37 (Oxford University Press).

Holmes, J.M. (1967) The Purchasing Power Parity Theory: In Defence of Gustav Cassel as a Modern Theorist (J. of Political Economy, Vol. 75).

Honohan, P. (1979) Exchange Rate Indices (Central Bank of Ireland Quarterly Bulletin, Summer).

Hooper, P. and Morton, J. (1978) Summary Measures of the Dollar's Foreign Exchange Value (Federal Reserve Bulletin, Vol. 64, No. 10).

Howson, S. (1975) Domestic Monetary Management in Britain, 1919-38 (Cambridge University Press).

_____, (1976) The Managed Floating Pound (The Banker, Vol. 126).

_____, (1980) Sterling's Managed Float: The Operation of the Exchange Equilisation Account, 1932-9 (Princeton Studies in International Finance, No. 46).

Hudgins, Jnr., M.W. (1973) Currency and Exchange Rate Fluctuations under a System of Stabilisation Funds: the Pound-Dollar Rate, 1931-8 (unpublished Ph.d. dissertation, University of Virginia).

Humphrey, T.M. (1977) A Monetary Model of Exchange Rate Determination (Federal Reserve Bank of Richmond, Vol. 63, No. 1).

Isard, P. (1978) Exchange Rate Determination: A Survey of Popular Views and Recent Models (Princeton Studies in International Finance, No. 42).

Johnson, H.G. and Nash, J.E. (1969) The U.K. and Floating Exchanges (Institute of Economic Affairs, Hobart papers, No. 46).

Kalamotousakis, G.J. (1978) Exchange Rates and Prices: the Historical Evidence (J. of International Economics, Vol. 8).

Kalecki, M. (1938) The Lessons of the Blum Experiment (Economic Journal, Vol. 48).

Katseli-Papaefstratiou, L.T. (1979) The Re-emergence of the Purchasing Power Parity Doctrine in the 1970's (Special Paper in International Economics, No. 13, Princeton University).

Kelejian, H.H. and Oates, W.E. (1974) Introduction to Econometrics (Harper and Row, New York).

Kemp, M.C. (1963)   Speculation, Profitability and Price Stability
(Review of Economics and Statistics, Vol. 45).

Kemp, T. (1967)   The French Economy under the Franc Poincaré (Economic
History Review, Vol. 20).

_____, (1972)   The French Economy, 1919-1939 (Longman).

Kenen, P. (1975)   International Trade and Finance (Cambridge University
Press).

Kindleberger, C.P. (1973)   The World in Depression, 1929-39 (Allen Lane,
London).

Kmenta, J. (1971)   Elements of Econometrics (Macmillan, New York).

Kouri, P.J.K. (1976)   The Exchange Rate and the Balance of Payments in
the Short Run and in the Long Run: A Monetary
Approach (Scandinavian Journal of Economics,
Vol. 78).

Kravis, I.B. and Lipsey, R.E. (1978)   Price Behaviour in the Light of
Balance of Payments Theories (J. of
International Economics, Vol. 8).

Kreinin, M.E. (1977)   The Effect of Exchange Rate Changes on the Prices
and Volumes of Foreign Trade (IMF Staff Papers,
Vol. 24).

Krueger, A.O. (1969)   Balance of Payments Theory (J. of Economic
Literature, Vol. 7).

Krugman, P.R. (1978)   Purchasing Power Parity and Exchange Rates: Another
Look at the Evidence (J. of International Economics,
Vol. 8).

Lanyi, A. (1969)   The Case for Floating Exchange Rates Reconsidered
(Princeton Essay in International Finance, No. 72).

Laury, J.S.E. (1977)   The Role of Exchange Rates in Balance of Payments
Adjustment (Economic Journal, Vol. 87).

League of Nations (1938)   Report on Exchange Control (submitted by a
Committee comprised of Members of the Economic
and Financial Committees).

_____,(1942)   Commercial Policy in the Inter-War Period:
International Proposals and National Policies
(Economic, Financial and Transit Dept.,)

_____,(1943)   Quantitative Trade Controls: Their Causes and
Nature (Economic, Financial and Transit Dept.,).

Lewis, W.A. (1949)   Economic Survey, 1919-39 (Allen and Unwin, London).

Lindbeck, A. (1976)   Approaches to Exchange Rate Analysis: An Introduction
(Scandinavian Journal of Economics, Vol. 78).

Marcus, E. (1954) Canada and the International Business Cycle, 1927-39 (New York).

Marjolin, R. (1938) Reflections on the Blum Experiment (Economica, Vol. 5).

Meade, J.E. (1956) The Belgium-Luxembourg Economic Union, 1921-1939 (Princeton Essay in International Finance, No. 25).

Mellish, G.H. and Hawkins, R.G. (1968) The Stability of Flexible Exchange Rates - The Canadian Experience (New York Graduate School of Business Administration and Institute of Finance Bulletin, No. 50-51).

Morgan, E.V. (1955) The Theory of Flexible Exchange Rates (American Economic Review, Vol. 45).

Mudgett, B.D. (1951) Index Numbers (J. Wiley and Sons).

Mundell, R.A. (1968) International Economics (New York).

Myhrman, J. (1976) Experiences of Flexible Exchange Rates in Earlier Periods: Theories, Evidence and a New View (Scandinavian Journal of Economics, Vol. 80).

Nurkse, R. (1944) International Currency Experience (League of Nations).

_____, (1945) Conditions of International Monetary Equilibrium (Princeton Essay in Finance, No. 4).

Officer, L.H. (1974) Purchasing Power Parity and Factor Price Equilisation (Kyklos, Vol. 27).

_____, (1976a) The Purchasing Power Parity Theory of Exchange Rates: A Review Article (IMF Staff Papers, Vol. 23).

_____, (1976b) The Productivity Bias in Purchasing Power Parity: An Econometric Investigation (IMF Staff Papers, Vol. 23).

_____, (1980) Effective Exchange Rates and Price Ratios over the Long Run: A Test of the Purchasing Power Parity Theory (Canadian Journal of Economics, Vol. 13).

Ozmun, J.D. (1976) An Analysis of Managed Floating Exchange Rates: The French Franc, 1931-8 (unpublished Ph.d. dissertation, University of Oklahoma).

Paish, F.W. (1935) The British Exchange Equalisation Fund (Economica, Vol. 2).

_____, (1936) The British Exchange Equalisation Fund in 1935 (Economica, Vol. 3).

_____, (1937) The British Exchange Equalisation Fund in 1935-37 (Economica, Vol. 4).

Pippenger, J.E. (1973) Speculation in the Flexible Exchange Revisited (Kyklos, Vol. 26).

Polak, J.J. (1943) European Exchange Depreciation in the Early
                    1920's (Econometrica, Vol. 11).

Pollard, S. (1969) The Development of the British Economy, 1914-67
                    (2nd ed., Edward Arnold, London).

Poole, W. (1967) The Stability of the Canadian Flexible Exchange Rate,
                  1950-62 (Canadian Journal of Economics and Political
                  Science, Vol. 3).

Porter, M. and Kouri, P. (1974) International Capital Flows and
                                 Portfolio Equilibrium (J. of Political
                                 Economy, Vol. 82).

Prais, S.J. (1962) Econometric Research in Trade (Kyklos, Vol. 15).

Pumphrey, L.M. (1942) The Exchange Equilisation Account of Great Britain,
                       1932-39: Exchange Operations (American Economic
                       Review, Vol. 32).

Redmond, J. (1980) An Indicator of the Effective Exchange Rate of the
                    Pound in the Nineteen-Thirties (Economic History
                    Review, Vol. 33).

Rhomberg, R.R. (1960) Canada's Foreign Exchange Market: A Quarterly
                       Model (IMF Staff Papers, Vol. 7).

_____, (1964) A Model of the Canadian Economy under Fixed and
                        Fluctuating Exchange Rates (J. of Political Economy,
                        Vol. 72).

_____, (1976) Indices of Effective Exchange Rates (IMF Staff
                        Papers, Vol. 23).

Richardson, J.D. (1978) Some Empirical Evidence on Commodity Arbitrage
                         and the Law of One Price (J. of International
                         Economics, Vol. 8).

Richardson, H.W. (1967) Economic Recovery in Britain, 1932-39 (Weidenfield
                         and Nicolson, London).

Ridler, D. and Yandle, C.A. (1972) A Simplified Model for Analysing the
                                    Effects of Exchange Rates on Exports
                                    of a Primary Commodity (IMF Staff
                                    Papers, Vol. 19).

Ridpath, J.B. (1975) An Econometric and Historical Study of the Freely
                      Floating Canadian Dollar, 1931-39 (unpublished
                      Ph.d. dissertation, University of Virginia).

Safarian, A. (1959) The Canadian Economy in the Great Depression,
                     (Toronto).

Samuelson, P. (1964) Theoretical Notes on Trade Problems (Review of
                      Economics and Statistics, Vol. 46).

Sauvy, A. (1969) The Economic Crisis of the 1930's in France (J. of
                  Contemporary History, Vol. 4).

Savin, N.E. and White, K.J. (1977) The Durbin Watson Test for Serial
                        Correlation with Extreme Sample Sizes or
                        Many Regressors (Econometrica, Vol. 45).

Sayers, R.S. (1976) The Bank of England (Cambridge University Press)
                        (2 vols.).

Schadler, S. (1977) Sources of Exchange Rate Variability: Theory and
                        Empirical Evidence (IMF Staff Papers, Vol. 24).

Shepherd, H.L. (1936) The Monetary Experience of Belgium, 1931-36
                        (Princeton University).

Sohmen, E. (1969) Flexible Exchange Rates (2nd ed., University of
                        Chicago).

Stein, J.L. (1961) Destabilising Speculative Activity can be Profitable
                        (Review of Economics and Statistics, Vol. 43).

_____, (1965) International Short-Term Capital Movements (American
                        Economic Review, Vol. 55).

Stein, J.L. and Tower, E. (1967) The Short Run Stability of the Foreign
                        Exchange Market (Review of Economics and
                        Statistics, Vol. 49).

Stolper, W.F. (1948) Purchasing Power Parity and the Pound Sterling,
                        1919-25 (Kyklos, Vol. 2).

Telser, L.G. (1959) A Theory of Speculation relating Profitability and
                        Stability (Review of Economics and Statistics, Vol. 41).

Thomas, L.B. (1973a) Behaviour of Flexible Exchange Rates: Additional
                        Tests from the post-WW1 episode (Southern Economic
                        Journal, Vol. 40).

_____, (1973b) Speculation in the Flexible Exchange Revisited -
                        Another View (Kyklos, Vol. 26).

Thomas, J.J. (1977) Some Problems in the Use of Almon's Technique in the
                        Estimation of Distributed Lags (Empirical Economics,
                        Vol. 2).

Thompson, R.W. (1970) International Trade and Domestic Prosperity:
                        Canada, 1926-38 (University of Toronto Press).

Thygesen, N. (1978) Inflation and Exchange Rates: Evidence and Policy
                        Guidelines for the European Community (J. of
                        International Economics, Vol. 8).

Tichy, G. (1976) Theoretical and Empirical Difficulties in Estimating
                        Exchange Rate Effects (German Economic Review, Vol. 14).

Tsiang, S.C. (1957) An Experiment with a Flexible Exchange System: the
                        Case of Peru, 1950-54 (IMF Staff Papers, Vol. 4)

_____, (1958) A Theory of Foreign Exchange Speculation under a
                        Floating Exchange System (J. of Political Economy,
                        Vol. 66).

Tsiang, S.C. (1959) Fluctuating Exchange Rates in Countries with
                     Relatively Stable Economies (IMF Staff Papers,
                     Vol. 7).

Vaubel, R. (1978) Real Exchange Rate Changes in the European Community:
                   A New Approach to the Determination of Optimum Currency
                   Areas (J. of International Economics, Vol. 8).

Wesolowsky, G.O. (1976) Multiple Regression and the Analysis of
                         Variance (John Wiley and Sons, New York).

Whitaker, J.K. and Hudgins Jnr., M.W. (1976) The Floating Pound Sterling
                         of the 1930's: An Econometric Study
                         (Southern Economic Journal, Vol. 43).

Williams, H.R. (1972) Foreign Exchange Monetary Effects of Alternative
                       Exchange Rate Systems (Economia Internazionale,
                       Vol. 25).

Williamson, J. (1972) Another Case of Profitable Destabilising Speculation
                       (J. of International Economics, Vol. 2).

Wilson, R. (1976) Effective Devaluation and Inflation (Oxford Economic
                   Papers, Vol. 28).

Wimmer, L.T. (1975) The Gold Crisis of 1869: Stabilising or Destabilising
                     Speculation under Floating Exchange Rates? (Explorations
                     in Economic History, Vol. 12).

Wolfe, M. (1951) The French Franc between the Wars (Columbia University
                  Press, New York).

World Financial Markets (1976) Effective Exchange Rates Refined (August).

_____,(1978) Effective Exchange Rates: Nominal and
                              Real (May).

_____,(1979) Effective Exchange Rates Compared (April).

Wright, J.F. (1981) Britain's Inter-War Experience (Oxford Economic Papers,
                     Vol. 33, Supplement).

Yeager, L.B. (1958) A Rehabilitation of Purchasing Power Parity (J. of
                     Political Economy, Vol.66).

_____, (1969) Fluctuating Exchange Rates in the Nineteenth Century:
                     the Experiences of Austria and Russia (in R.A. Mundell
                     and A.K. Swoboda, eds., Monetary Problems of the
                     International Economy, University of Chicago).

_____, (1976) International Monetary Relations (2nd ed., Harper
                     and Row, New York).

Youngson, A.J. (1960) The British Economy, 1920-57 (London).

_____, (1968) Britain's Economic Growth, 1920-66 (2nd ed.,
                     London).